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THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

VOLUME THE TWENTY-FIFTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1864.

CONTENTS OF VOL. XXV.

APPENDIX.

DIRECTIONS TO THE BINDER.

The Binder is desired to collect together all the Appendix matter, with Roman numeral folios, and place it at the *end* of each volume of the Journal, excepting Titles and Contents, and Statistics &c., which are in all cases to be placed at the *beginning* of the Volume: the lettering at the back to include a statement of the *year* as well as the *volume*; the first volume belonging to 1839-40, the second to 1841, the third to 1842, the fourth to 1843, and so on.

In Reprints of the Journal all Appendix matter and, in one instance, an Article in the body of the Journal (which at the time had become obsolete), were omitted; the Roman numeral folios, however (for convenience of reference), were reprinted without alteration in the Appendix matter retained.

ON THE METEOROLOGY OF ENGLAND DURING THE QUARTER ENDING SEPTEMBER 30, 1863.

By JAMES GLAISHER, Esq., F.R.S.,

SEC. OF THE BRITISH METEOROLOGICAL SOCIETY.

From July 1st to 15th, excepting two days, the temperature of the air exceeded the average by 2¼°. This was followed by a cold period extending to August 1st, during which the daily deficiency averaged 3¾°. On July 19th the temperature fell to 32° in the air, and much lower on the ground, at most places north of London. A warm period succeeded, and continued till August 16th, the excess of temperature amounting to 3½°. From the 17th August to the end of September it was cold, the average daily deficiency being 2¼°.

The mean high day temperature of the air was ¾° in excess in July, 1° in excess in August, and 4° in defect in September, as compared with the averages of the preceding 22 years.

The mean low night temperature of the air was 3¾° in defect in July, ½° in excess in August, and 3° in defect in September.

The mean temperature of the air was ¾° in defect in July, ½° in excess in August, and 3¼° in defect in September.

The mean temperature of the dew-point was 2° in defect in July, 0°·5 in defect in August, and 4°·3 in defect in September. The degree of humidity was below its average value.

The pressure of the atmosphere in each month was slightly in excess in July, and a little below the average in August and September.

The fall of rain in July was 0·9 inch, in August 1·8 inch, and in September 3·2 inches; the total fall for the quarter was 5·9 inches, being 1·6 inch below the average of the preceding 47 years.

The temperature of vegetation as shown by a thermometer placed on grass was below 30° on 4 nights, between 30° and 40° on 26 nights, and above 40° on the other 62 nights.

The mean temperature of the air at Greenwich in the three months ending August, constituting the three summer months, was 60°·3, being 0°·2 above the average of the preceding 92 years.

The Weather during the Quarter ending September 30, 1863.

1863. Months.	Temperature of Air. Mean.	Air. Diff. from average of 92 years.	Air. Diff. from average of 22 years.	Evaporation. Mean.	Evaporation. Diff. from average of 22 years.	Dew Point. Mean.	Dew Point. Diff. from average of 22 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 22 years.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 22 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 22 years.
	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
July	60·8	-0·6	-0·7	55·9	-1·5	51·7	-2·1	24·9	+4·4	·384	-·032	4·3	-0·3
August ..	61·9	+1·2	+0·6	57·4	-0·2	53·6	-0·5	20·1	+0·6	·412	-·010	4·5	-0·2
September ..	53·7	-2·7	-3·3	50·2	-3·7	46·8	-4·3	17·7	-0·8	·321	-·061	3·6	-0·6
Mean ..	58·8	-0·7	-1·1	54·5	-1·8	50·7	-2·3	20·9	+1·4	·372	-·034	4·1	-0·4

1863. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff from average of 22 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 22 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 22 years.	Rain. Amount.	Rain. Diff. from average of 47 years.	Temperature of Water of the Thames.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Number of Nights it was Between 30° and 40°.	Number of Nights it was Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	°				°	°
July	72	-4	29·961	+0·167	532	+4	0·9	-1·8	66·1	1	8	22	28·4	53·2
August ..	74	-3	29·744	-0·047	527	-2	1·8	-0·6	65·5	0	1	30	37·2	57·5
September ..	77	-4	29·693	-0·132	535	+1	3·2	+0·8	61·7	3	17	10	27·7	50·2
Mean ..	74	-4	29·799	-0·004	531	+1	Sum 5·9	Sum -1·6	Mean 64·4	Sum 4	Sum 26	Sum 62	Lowest 27·7	Highest 57·5

Note.—In reading this table it will be borne in mind that the sign (–) minus signifies below the average, and that the sign (+) plus signifies above the average.

ON

THE METEOROLOGY OF ENGLAND

DURING

THE QUARTER ENDING DECEMBER 31, 1863.

BY JAMES GLAISHER, ESQ., F.R.S.,

SEC. OF THE BRITISH METEOROLOGICAL SOCIETY.

TILL October 9th, the weather was alternately warm and cold; on the 10th a warm period set in, continuing to the 22nd, the average daily excess being nearly 5°; thence to November 13th the temperature was variable, the average daily deficiency being rather more than 1°. For the remaining 48 days of the quarter the temperature was greatly above the average, the excess amounting to 4½° daily. The period from October 30th till December 4th was unusually stormy.

The mean high day temperature was about the average in October, 2° in excess in November, and 3°·4 in excess in December.

The mean low night temperature was 2°·1 in excess in October, 2°·9 in excess in November, and 1°·1 in excess in December.

The mean temperature of the air was 1° in excess in October, 1°·75 in excess in November, and nearly 3° in excess in December.

The mean temperature of the dew-point was 1°·25 in excess in October, 2°·5 in excess in November, and 1°·5 in excess in December; the degree of humidity being about its average in October and November, and below in December.

The pressure of the atmosphere was a little below its average in October, and a little above in November and December.

The fall of rain was 1·7 inch in October, 1·8 inch in November, and 1·1 inch in December. The total fall for the quarter was 4·6 inches, being 2½ inches below the average of the preceding 46 years.

The temperature of vegetation was below 30° on 28 nights; between 30° and 40° on 36 nights; and above 40° on 28 nights.

The mean temperature of the air at Greenwich in the three months ending November, constituting the three autumn months, was 50°·3, being 0°·9 above the average of the preceding 92 years.

THE WEATHER DURING THE QUARTER ENDING DECEMBER 31, 1863.

1863. MONTHS.	Temperature of Air: Mean.	Air: Diff. from average of 92 years.	Air: Diff. from average of 22 years.	Evaporation: Mean.	Evaporation: Diff. from average of 22 years.	Dew Point: Mean.	Dew Point: Diff. from average of 22 years.	Air—Daily Range: Mean.	Air—Daily Range: Diff. from average of 22 years.	Elastic Force of Vapour: Mean.	Elastic Force of Vapour: Diff. from average of 22 years.	Weight of Vapour in a Cubic Foot of Air: Mean.	Weight of Vapour: Diff. from average of 22 years.
	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
October ..	51·6	+2·1	+1·1	49·7	+1·2	47·8	+1·4	12·7	-2·0	·333	+·016	3·7	0·0
November ..	45·7	+3·3	+1·7	44·2	+2·6	42·4	+2·6	10·8	-0·9	·271	+·019	3·1	+0·3
December ..	43·2	+4·2	+2·9	41·1	+2·3	38·5	+1·4	11·8	+2·3	·233	+·010	2·7	+0·1
Mean ..	46·8	+3·2	+1·9	45·0	+2·0	42·9	+1·8	11·8	−0·2	·279	+·015	3·2	+0·1

1863. MONTHS.	Degree of Humidity: Mean.	Degree of Humidity: Diff. from average of 22 years.	Reading of Barometer: Mean.	Reading of Barometer: Diff. from average of 22 years.	Weight of a Cubic Foot of Air: Mean.	Weight of a Cubic Foot of Air: Diff. from average of 22 years.	Rain: Amount.	Rain: Diff. from average of 46 years.	Temperature of Water of the Thames.	Reading of Thermometer on Grass: Number of Nights it was At or below 30°.	Number of Nights it was Between 30° and 40°.	Number of Nights it was Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	°				°	°
October ..	87	0	29·638	−0·061	537	−2	1·7	−1·1	54·8	1	14	16	23·0	50·8
November ..	88	-1	29·870	+0·121	547	−1	1·8	−0·6	48·5	11	12	7	17·7	48·8
December ..	83	-6	29·942	+0·126	552	0	1·1	−0·8	44·0	16	10	5	16·2	43·0
Mean ..	86	-2	29·817	+0·062	545	−1	Sum 4·6	Sum −2·5	Mean 49·1	Sum 28	Sum 36	Sum 28	Lowest 16·2	Highest 50·8

NOTE.—In reading this table it will be borne in mind that the sign (−) minus signifies below the average, and that the sign (+) plus signifies above the average.

STATE OF THE PUBLIC HEALTH.

1st Quarter.—The total number of deaths in the quarter was 112,384 against 101,232 and 92,225 in the two previous summer quarters. In the same quarter of 1860 it was only 86,312; and if last summer had been as healthy, at least 23,000 persons would have been living when autumn came whose deaths had then been registered. The annual rate of mortality in the quarter was 2·166 per cent. of the population, against the summer average of 1·982 per cent. In the country districts the mortality was 1·864 (the average being 1·694); whilst in urban populations it was 2·404 (the average being 2·329).

2nd Quarter.—The number of deaths in the three months ending 31st December was 116,299. The death-rate was 2·226 per cent. (against an average of 2·178). In the principal towns the rate of mortality was 2·46 per cent. (about the average); and in the small towns and country parishes 1·94 per cent. (or rather above the average). 475,582 deaths were registered in the year, the mortality being at the rate of 2·314 per cent. against 2·211, the average of the previous ten years.

PRICE OF PROVISIONS.

1st Quarter.—The average price of wheat was 45*s.* 7*d.* per quarter, which is less than at any other time since March, 1860; in the September quarter of last year the price was 56*s.* 10*d.* The average of the highest and lowest prices of beef at Leadenhall and Newgate Markets was 5⅜*d.* per lb., and of mutton 5¾*d.* Best potatoes ranged from 70*s.* to 105*s.* per ton at the Waterside Market, Southwark; they were cheaper than they had been at the same place at any previous time since the same quarter of 1859.

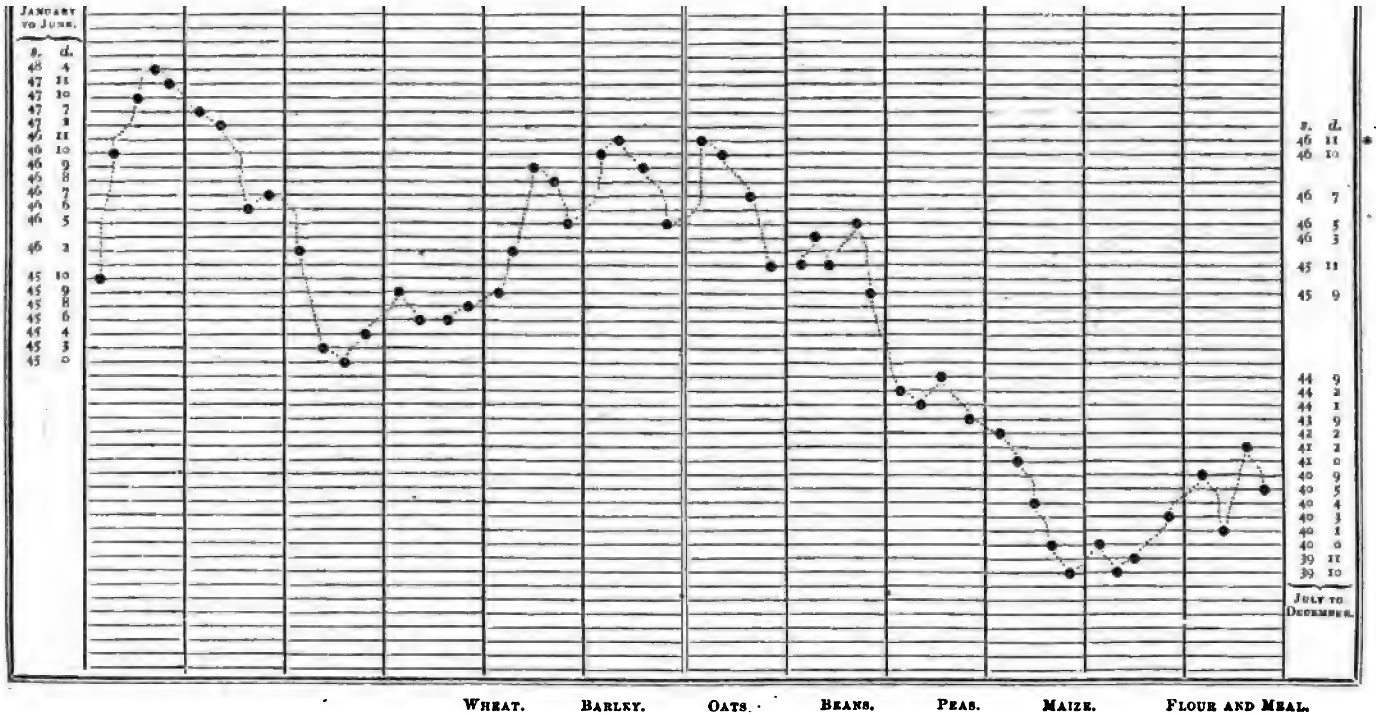
2nd Quarter.—The average price of wheat in the three months was 40*s.* 6*d.* per quarter, which is less by 18*s.* 9*d.* than in the corresponding period of 1861, and less by 7*s.* 8*d.* than in that of 1862. The average price of beef at Leadenhall and Newgate Markets was 5⅛*d.* per lb., mutton 6*d.*; both being the same as in the corresponding quarter of 1862. The average price of the best potatoes at the Waterside Market was 70*s.* per ton, which is less by 30*s.* than it was in the last quarter of the previous year.

THE PRICE OF PROVISIONS.

The AVERAGE PRICES of Consols, of Wheat, Meat, and Potatoes; also the AVERAGE QUANTITY of Wheat sold and imported weekly, in each of the Nine Quarters ending December 31, 1863.

Quarters ending	Average Price of Consols (for Money).	Average Price of Wheat per Quarter in England and Wales.	Wheat sold in the 290 Cities and Towns in England and Wales making Returns.* Average number of Quarters weekly.	Wheat and Wheat Flour entered for Home Consumption at Chief Ports of Great Britain.* Average number of Quarters weekly.	Average Prices of Meat per lb. at Leadenhall and Newgate Markets (by the Carcase). Beef.	Average Prices of Meat per lb. at Leadenhall and Newgate Markets (by the Carcase). Mutton.	Average Prices of Best Potatoes per Ton at Waterside Market, Southwark.
1861	£	s. d.					
Dec. 31	93⅜	59 3	112,809	121,480	4d.—6½d. Mean 5⅛d.	4¾d.—6¾d. Mean 5¾d.	110s.—130s. Mean 120s.
1862							
Mar. 31	93⅛	60 1	74,163	132,882	4d.—6¼d. Mean 5⅛d.	4¾d.—6½d. Mean 5⅝d.	130s.—155s. Mean 142s. 6d.
June 30	93⅝	56 8	58,728	136,230	4d.—6d. Mean 5d.	5d.—7d. Mean 6d.	180s.—200s. Mean 190s.
Sept. 30	93⅜	56 10	57,592	295,276	4¼d.—6½d. Mean 5¼d.	5¼d.—7d. Mean 6⅛d.	100s.—130s. Mean 115s.
Dec. 31	93⅜	48 2	85,522	258,095	4d.—6¼d. Mean 5⅛d.	5¼d.—6¾d. Mean 6d.	90s.—110s. Mean 100s.
1863							
Mar. 31	92⅞	46 7	75,819	139,429	4d.—6¼d. Mean 5⅛d.	5d.—7d. Mean 6d.	120s.—130s. Mean 125s.
June 30	93⅛	46 2	82,458	106,633	4¼d.—6¼d. Mean 5¼d.	4¾d.—6¾d. Mean 5¾d.	110s.—130s. Mean 120s.
Sept. 30	93	45 7	73,920	157,582	4½d.—6¼d. Mean 5⅜d.	4¾d.—6¾d. Mean 5¾d.	70s.—105s. Mean 87s. 6d
Dec. 31	92⅞	40 6	113,397	145,823	4d.—6¼d. Mean 5⅛d.	5d.—7d. Mean 6d.	60s.—80s. Mean 70s.
Col.	1	2	3	4	5	6	7

* NOTE.—The total number of quarters of wheat sold in England and Wales for the 13 weeks ending December 31st, 1861, was 1,466,525; for the 13 weeks ending March 31st, 1862, 964,121; for the 13 weeks ending June 30th, 1862, 763,463; for the 13 weeks ending September 30th, 1862, 748,702; for the 13 weeks ending December 31st, 1862, 1,111,787; for the 13 weeks ending March 31st, 1863, 985,649; for the 13 weeks ending June 30th, 1863, 1,073,126; for the 13 weeks ending September 30th, 1863, 960,956; and for the 13 weeks ending December 31st, 1863, 1,474,160. The total number of quarters entered for Home Consumption was respectively, 1,579,241; 1,727,464; 1,770,998; 3,838,584; 3,355,239; 1,812,585; 1,386,233; 2,048,568; and 1,895,705.


January to June.
s. d.
48 4
47 11
47 10
47 7
47 3
46 11
46 10
46 9
46 8
46 7
46 6
46 5
46 2
45 10
45 9
45 8
45 6
45 4
45 3
45 0
s. d.
46 11
46 10
46 7
46 5
46 3
45 11
45 9
44 9
44 2
44 1
43 9
42 2
41 2
41 0
40 9
40 5
40 4
40 3
40 1
40 0
39 11
39 10
July to December.
Wheat.
Barley.
Oats.
Beans.
Peas.
Maize.
Flour and Meal.

ON

THE METEOROLOGY OF ENGLA

DURING

THE QUARTER ENDING MARCH 31, 1864.

By JAMES GLAISHER, Esq., F.R.S.,

SEC. OF THE BRITISH METEOROLOGICAL SOCIETY.

The year 1863 closed with very fine weather for the season all the country, which had continued for several weeks. At beginning of January 1864 the weather changed, and till the 9 was exceedingly cold, averaging a daily deficiency of 5½°. On 10th a period of warm, damp, and foggy weather set in, and February 3 there was an average daily excess of 3½° of temperat On February 4 a cold period set in, lasting till the 11th; five warm weather followed, ending the 16th; the daily excess, nearly. From February 17th the weather was altogether win and the average daily deficiency for 16 days, ending Marc was 4½°. From March 4 to 15 the weather was warm, with excess of 2½° daily; from March 16 to the end of the quarter deficiency was 2°. During the quarter there was an unu number of alternations in temperature.

The mean high day temperature was below the average to amount of 1°·9, 3°·6, and 0°·4 respectively in these three mon The mean low night temperature was below the average to amount of 1°·9, 2°·4, and 1°·3 respectively. Therefore both days and nights were cold in these three months.

The mean temperature of the air in January was 1°·8, in F ruary 2°·9, and in March 0°·7 below the respective averages of preceding 23 years.

The mean temperature of the dew-point was 4°·0, 3°·5, and below the averages of the preceding 23 years.

The degree of humidity was less than its average in January February, and a little above in March.

The pressure of the atmosphere was a little more than ¼ in. in ex in January, somewhat in defect in February, and about ¼ in. in Ma

The fall of rain was in defect in January and February to amount of 0·9 in. and 0·8 in. respectively, and in excess to amount of 1·2 in. in March.

The mean temperature of the air at Greenwich in the t months ending February, constituting the three winter months, 38°·6, being 0°·7 above the average of the preceding 93 years.

The Weather during the Quarter ending March 31, 1864.

1864. Months.	Temperature of Air. Mean.	Air. Diff. from average of 93 years.	Air. Diff. from average of 23 years.	Evaporation. Mean.	Evaporation. Diff. from average of 23 years.	Dew Point. Mean.	Dew Point. Diff. from average of 23 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 23 years.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 23 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 23 years.
	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
January ..	36·5	+0·3	-1·8	34·4	-2·7	31·3	-4·0	9·7	0·0	·176	-·028	2·0	-0·4
February ..	36·0	-2·3	-2·9	34·1	-3·1	31·3	-3·5	10·3	-1·2	·176	-·028	2·0	-0·4
March	41·3	+0·3	-0·7	39·1	-0·7	36·2	-0·6	15·5	+0·8	·215	-·004	2·5	0·0
Mean ..	37·9	-0·6	-1·8	35·9	-2·2	32·9	-2·7	11·8	-0·1	·189	-·020	2·2	-0·3

1864. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 23 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 23 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 23 years.	Rain. Amount.	Rain. Diff. from average of 23 years.	Temperature of Water of the Thames.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Number of Nights it was Between 30° and 40°.	Number of Nights it was Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	°				°	°
January ..	82	-7	30·044	+0·284	561	+7	0·9	-0·9	39·7	18	10	3	6·0	43·1
February ..	88	-2	29·760	-0·044	557	+3	0·8	-0·8	38·5	18	11	0	12·1	37·3
March	83	+1	29·503	-0·266	546	-4	2·7	+1·2	43·0	18	12	1	19·6	41·3
Mean ..	83	-3	29·769	-0·009	555	+2	Sum 4·4	Sum -0·5	Mean 40·4	Sum 54	Sum 33	Sum 4	Lowest 6·0	Highest 43·1

Note.—In reading this table it will be borne in mind that the sign (−) minus signifies below the average, and that the sign (+) plus signifies above the average.

ON THE METEOROLOGY OF ENGLAND DURING THE QUARTER ENDING JUNE 30, 1864.

BY JAMES GLAISHER, ESQ., F.R.S.,
SEC. OF THE BRITISH METEOROLOGICAL SOCIETY.

THE quarter ending March closed with cold and changeable weather, which continued to the 8th of April; the average daily deficiency from March 16, to April 8, was 1°·8. A warm period set in on the 9th, and continued to May 22; the excess for these 44 days was 3½° nearly. From May 23 to the end of the quarter the weather was cold, with the exception of June 6 to 10; the deficiency for the 39 days, ending June 30, amounted to 2½° nearly daily.

The mean temperature of April was 48°·2, being 1°·7 above the average of the preceding 23 years.

The mean temperature of May was 53°·8, being 0°·9 above the average of 23 years.

The mean temperature of June was 57°·4, being 1°·7 below the average of 23 years.

The mean high day temperatures for the months of April, May, and June were 58°·3, 64°·8, and 69°·5, being 1°·3 above, 0°·3 below, and 1°·4 below their respective averages. The mean low night temperatures for these three months were 40°, 44°·9, and 49°·1, being 1°·3 above, 0°·7 below, and 1°·1 below their averages respectively. Therefore both the days and nights were warm in April, and cold in May and June.

The mean temperature of the dew-point was 0°·2 below its average in April, was its average in May, and 2°·1 below it in June.

The degree of humidity was very uniform, and always its average.

The pressure of the atmosphere was in excess in the months of April and May; in the former to less than 0·2 in., and in the latter to less than 0·1 in.; in June it scarcely differed from its average.

The fall of rain was in defect in each month. It was 0·7 in. in April, being 1·1 in. too small; 1·9 in. in May, being 0·2 in. in defect; and 0·9 in. in June, or 1 in. below the average.

The mean temperature of the air at Greenwich in the three months ending May, constituting the three spring months, was 47°·8, being 1°·3 above the average of the preceding 93 years.

THE WEATHER DURING THE QUARTER ENDING JUNE 30, 1864.

1864. Months.	Temperature of Air. Mean.	Air. Diff. from average of 93 years.	Air. Diff. from average of 23 years.	Evaporation. Mean.	Evaporation. Diff. from average of 23 years.	Dew Point. Mean.	Dew Point. Diff. from average of 23 years.	Air—Daily Range. Mean.	Air—Daily Range. Diff. from average of 23 years.	Elastic Force of Vapour. Mean.	Elastic Force of Vapour. Diff. from average of 23 years.	Weight of Vapour in a Cubic Foot of Air. Mean.	Weight of Vapour in a Cubic Foot of Air. Diff. from average of 23 years.
	°	°	°	°	°	°	°	°	°	in.	in.	grs.	gr.
April	48·2	+2·4	+1·7	44·3	+0·8	40·0	−0·2	18·3	+0·1	·248	−·002	2·9	0·0
May	53·8	+1·3	+0·9	49·7	+0·5	45·6	0·0	19·9	−0·4	·306	+·003	3·5	0·0
June	57·4	−0·7	−1·7	52·8	−1·9	48·7	−2·1	20·4	−0·3	·344	−·029	3·9	−0·3
Mean ..	53·1	+1·0	+0·3	48 9	−0·2	44·8	−0·8	19·5	−0·2	·299	−·009	3·4	−0·1

1864. Months.	Degree of Humidity. Mean.	Degree of Humidity. Diff. from average of 23 years.	Reading of Barometer. Mean.	Reading of Barometer. Diff. from average of 23 years.	Weight of a Cubic Foot of Air. Mean.	Weight of a Cubic Foot of Air. Diff. from average of 23 years.	Rain. Amount.	Rain. Diff. from average of 47 years.	Temperature of Water of the Thames.	Reading of Thermometer on Grass. Number of Nights it was At or below 30°.	Between 30° and 40°.	Above 40°.	Lowest Reading at Night.	Highest Reading at Night.
			in.	in.	grs.	grs.	in.	in.	°				°	°
April	74	−5	29·915	+·164	547	+4	0·7	−1·1	50·4	8	19	3	22·9	45·5
May	73	−4	29·837	+·084	538	−5	1·9	−0·2	58·6	3	9	19	26·4	48·9
June	72	−3	29·792	−·007	533	−2	0·9	−1·0	61·4	0	12	18	32·1	56·2
Mean ..	73	−4	29·848	+·080	539	−1	Sum 3·5	Sum −2·3	Mean 56·8	Sum 11	Sum 40	Sum 40	Lowest 22·9	Highest 56·2

NOTE.—In reading this table it will be borne in mind that the sign (−) minus signifies below the average, and that the sign (+) plus signifies above the average.

STATE OF THE PUBLIC HEALTH.

1st Quarter.—The deaths greatly exceeded the average number. Seldom has a winter been more fatal; for 143,030 deaths—1572 a day—were registered in ninety-one days, including the additional day of leap year, for which due correction is made. The mortality was at the rate of 2·773 per cent.; whereas the average of the season in the preceding ten years was 2·490 per cent.; thus the rate was nearly 28 instead of 25 in 1000. 14,698 persons died in excess of the average number. Since 1842 it is only in the two winters (1847-48) after the potato failure, and in the winter of the Crimean war (1855), that the country has experienced any higher rates of mortality. The winter death-rate per 1000 was 2·850, and 2·794 in the former years, 2·910 in 1855, and 2·773 in 1864. London suffered to an extraordinary extent, and is accountable for a large share of the increase. The average annual rate of the winter quarter in London is 2·577 per cent., but in the last winter quarter the rate becomes 3·088, or ·511 above the average. The funerals increased in the proportion of five to six.

2nd Quarter.—The deaths which were registered in the quarter that ended on June 30 amounted to 116,899. The number is above the average of the deaths in the months of April, May, and June; but it is less than the number of deaths which were registered in the corresponding quarter of the previous year, and less by 26,131 than the deaths in the three first fatal winter months of this year. Then 1572 deaths were registered daily; in the present quarter the daily deaths have been 1284. The mortality has been at the rate of 2·260 in 100 living, or ·073 above the average of the spring quarters of the previous ten years. The mortality of the town populations has been at the rate of 2·369, and of the country populations 2·110 per cent.: thus the towns lost 18,392 lives, and the country 10,000 lives, in excess of the deaths which would have been registered had the mortality been at the rate prevailing in the least unhealthy districts of England and Wales. As a general rule the three spring months, April, May, June, are healthier than winter, and somewhat less healthy than the summer in ordinary years. They express very closely the average mortality of the year. Thus the average annual mortality per cent. in ten years (1854-63) was 2·214, and in the ten springs of those years, 2·187; it was less in the spring quarters by ·027.

PRICE OF PROVISIONS.

1st Quarter.—Meat more than maintained its price, but both wheat and potatoes were unusually cheap. The mean of the lowest and highest prices of beef as sold at Leadenhall and Newgate was $5\frac{1}{2}$*d.* against $5\frac{1}{8}$*d.* in the same quarter of the two previous years; and of mutton the mean price was $6\frac{1}{4}$*d.*, which is also higher than in either of the two corresponding periods. Wheat declined to 40*s.* 4*d.* per quarter, each period of three months since September 1862 having witnessed more or less fall in the price. From the date just specified the fall has caused a difference of 16*s.* 6*d.* per quarter. Best potatoes have fallen to a mean price of 62*s.* 6*d.* per ton at Southwark against double that price in the first three months of last year.

2nd Quarter.—Wheat was unusually cheap. Its average price in the three months was 39*s.* 7*d.* per quarter. In the corresponding period of 1862 it was 56*s.* 8*d.*; in that of 1863 it was 46*s.* 2*d.*. The mean of the highest and lowest prices of beef as sold by the carcase in Leadenhall and Newgate was $5\frac{1}{4}$*d.* per lb., and the same as in the June quarter of last year. Of mutton the mean price was $6\frac{1}{8}$*d.*, being higher than in the same season of 1862-63. The best potatoes were sold from 2*l.* to 3*l.* per ton in Southwark. The price was less than half of that for which they had been obtained in the spring of last year, and still lower in proportion to the price of 1862. The working classes enjoyed cheap markets for supplying themselves with the chief necessaries of life.

THE PRICE OF PROVISIONS.

The AVERAGE PRICES of Consols, of Wheat, Meat, and Potatoes; also the AVERAGE QUANTITY of Wheat sold and imported weekly, in each of the Nine Quarters ending June 30, 1864.

Quarters ending	Average Price of Consols (for Money).	Average Price of Wheat per Quarter in England and Wales.	Wheat sold in the 290 Cities and Towns in England and Wales making Returns.*	Wheat and Wheat Flour entered for Home Consumption at Chief Ports of Great Britain.*	Average Prices of Meat per lb. at Leadenhall and Newgate Markets (by the Carcase). Beef.	Mutton.	Best Potatoes per Ton at Waterside Market, Southwark.
			Average number of Quarters weekly.				
1862	£.	s. d.					
June 30	93⅝	56 8	58,728	136,230	4d.—6d. Mean 5d.	5d.—7d. Mean 6d.	180s.—200s. Mean 190s.
Sept. 30	93⅜	56 10	57,592	295,276	4¼d.—6¼d. Mean 5¼d.	5¼d.—7d. Mean 6⅛d.	100s.—130s. Mean 115s.
Dec. 31	93⅝	48 2	85,522	258,095	4d.—6¼d. Mean 5⅛d.	5¼d.—6¾d. Mean 6d.	90s.—110s. Mean 100s.
1863 Mar. 31	92⅛	46 7	75,819	139,429	4d.—6¼d. Mean 5⅛d.	5d.—7d. Mean 6d.	120s.—130s. Mean 125s.
June 30	93⅛	46 2	82,458	106,633	4¼d.—6¼d. Mean 5¼d.	4¾d.—6¾d. Mean 5¾d.	110s.—130s. Mean 120s.
Sept. 30	93	45 7	73,920	157,582	4½d.—6¼d. Mean 5⅜d.	4¾d.—6¾d. Mean 5¾d.	70s.—105s. Mean 87s. 6d.
Dec. 31	92⅞	40 6	113,397	145,823	4d.—6¼d. Mean 5⅛d.	5d.—7d. Mean 6d.	60s.—80s. Mean 70s.
1864 Mar. 31	91	40 4	99,013	138,523	4½d.—6½d. Mean 5½d.	5½d.—7d. Mean 6¼d.	55s.—70s. Mean 62s. 6d.
June 30	91⅛	39 7	92,569	100,102	4¼d.—6¼d. Mean 5¼d.	5¼d.—7d. Mean 6⅛d.	40s.—60s. Mean 50s.
Col.	1	2	3	4	5	6	7

* NOTE.—The total number of quarters of wheat sold in England and Wales for the 13 weeks ending June 30th, 1862, was 763,463; for the 13 weeks ending September 30th, 1862, 748,702; for the 13 weeks ending December 31st, 1862, 1,111,787; for the 13 weeks ending March 31st, 1863, 985,649; for the 13 weeks ending June 30th, 1863, 1,073,126; for the 13 weeks ending September 30th, 1863, 960,956; for the 13 weeks ending December 31st, 1863, 1,474,160; for the 13 weeks ending March 31st, 1864, 1,287,171; and for the 13 weeks ending June 30th, 1864, 1,203,406. The total number of quarters entered for Home Consumption in the same period was respectively, 1,770,998; 3,838,584; 3,355,239; 1,812,585; 1,386,233; 2,048,568; 1,895,705; 1,800,806; and 1,301,323.

HERTFORDSHIRE.

[The Drift is only shown where the Records of the Geological Survey certify its existence.]

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*Agricultural Progress and the Royal Agricultural Society.* By H. S. Thompson, M.P.

The Royal Agricultural Society was formed in 1838, and inscribed on the title-page of its Journal the significant motto "*Practice with Science.*" The present volume will end the first series of that publication, and the occasion seems a fitting one for reviewing and registering the results which Practice, aided by Science, has been able to accomplish during the intervening quarter of a century.

The period in question has been remarkable for several events, each of which has left its distinctive mark upon British agriculture, and any attempt to chronicle the progress of agricultural improvement since 1838 would be incomplete and even deceptive if it did not point out the important consequences resulting from the adoption of free trade, the rise and progress of the railway system, and the application of steam power to the operations of husbandry.

Before entering on these and other important questions connected with the subject before us, it will be proper to give a brief account of the progress and present position of the Royal Agricultural Society itself.

Commencement and Progress of the Royal Agricultural Society.—The commencement of the Society took place during one of those recurring fits of associative activity to which Englishmen are periodically prone. The Yorkshire Agricultural Society (for many years our largest provincial Agricultural Society, with a prize-list of 800*l.* to 1000*l.* per annum) was formed in 1837; the Royal Agricultural Society in 1838; the Royal Irish Improvement Society in 1841. The formation of these and numerous other local societies within a very brief period, and on an unusually extended scale both as to numbers and resources, was, in fact, the application to agriculture of the same tendency to organise companies which was so strongly developed about that time, and

culminated in the railway mania of 1845-46. Fortunately for agriculture, there were no premiums to be realized by joining these societies, so that they were not pushed beyond their legitimate limits, and have been productive of unmixed benefit.

Agricultural societies had been tried at a much earlier date. "The Bath Society for the encouragement of Agriculture, Arts, Manufactures, and Commerce within the Counties of Somerset, Wilts, Gloucester, and Dorset, and the City and County of Bristol," was formed in 1777. This society claims to be the earliest agricultural society founded in Great Britain. The Highland Society (Scotland) was constituted in 1784, and received a Royal Charter in 1787. The Charter of the English Board of Agriculture is dated August 23, 1793. These and other minor societies have doubtless been productive of much benefit in their respective localities, and can boast of the names of many patriotic and eminent men who enlisted in their ranks; but the times were not favourable for the development of such institutions, and all of them fell far short of the dimensions and wide-spread usefulness attained by the later societies, and by some of the older institutions themselves when reorganised at a later date.

The cause of this is obvious. So long as agricultural societies had *fixed places of meeting*, and the stock and implements intended for exhibition were conveyed over the *ordinary roads*, they drew their supplies from such limited areas, that their showyards were very indifferently furnished, and were only attractive to the residents in their immediate neighbourhood. From the paucity of their visitors the receipts were small, and their funds consequently insufficient to admit of their offering such prizes as would tempt more distant owners of stock to face the cost and risk of lengthened travel. The societies were thus compelled to trust more to donations and subscriptions than to the popularity of their shows as their chief source of revenue. Energetic managers and liberal patrons may for a time supply the place of more general support; but when the zeal or the strength of a few public-spirited individuals fails, societies, so supported, are either given up or fall into a state of chronic inaction, and it would be easy to prove from the annals of these early days that in order to be permanently useful all such societies must be self-supporting. Even the Board of Agriculture, with its perpetual Charter and Parliamentary grant, formed no exception to this rule; and notwithstanding the talent and energy with which for a time its operations were conducted, and the prestige attaching to the honoured names of its president, Sir J. Sinclair, and its secretary, Arthur Young, on the extinction of its Parliamentary grant in 1819, the Board was reduced to the last stage of exhaustion and died a natural death shortly after.

At the time of the renaissance of these societies the migratory principle was generally adopted. The Highland Society, which was reorganized in 1834 under the more extended title of "The Highland and Agricultural Society of Scotland," was probably the first to adopt this system, which was followed by the Yorkshire Society in 1837, by the Royal Agricultural Society in 1838, and subsequently by the Royal Irish Improvement Society, and some few of the leading provincial associations. The importance of not visiting the same district twice, except at an interval of some years, can scarcely be overrated, as by this means new exhibitors, new visitors, and new contributors to the expenses of the meetings are annually secured, and it is notorious that a life and activity have thus been infused into these meetings, of which previously they were in great need.

Second only in importance to the migratory principle has been the rapid extension of the railway system, by which stock, implements, and visitors have been conveyed to these shows in much less time and at much smaller cost, and therefore from much greater distances and in much larger numbers. The increased receipts thus obtained for admission to the showyards have furnished means for the offer of larger prizes, and thus increased the attractions of subsequent exhibitions, so that the improved mode of conveyance afforded by railways, and the improved policy of changing the places of meeting, have during the last twenty-five years fostered and developed these associations to an unprecedented extent, the published list for the present year containing the names of no less than 358 agricultural societies in Great Britain and Ireland.

The circumstances which favoured the formation of the Royal Agricultural Society having been thus briefly described, its progress will be best perceived by inspecting the accompanying statistical tables, which give the leading facts of its history in a compendious form.

Statistics of the Royal Agricultural Society.—Table (A.) shows the number of its members and its annual income and expenditure (irrespective of the country meetings), commencing with 1841, the first year in which the Society's balance-sheet and list of members were sufficiently complete to be of any value in a comparative point of view. Some explanatory remarks are, however, required to prevent misconceptions.

In column 2 will be found the number of members on the Society's books in each year at the time of the annual meeting in May. These figures give an average of 5522 for the whole period. A considerable deduction must, however, be made on account of those members who allowed their names to remain on

the books, but who refused to pay their subscriptions when in arrear, on the ground that they had ceased to be members of the society. During the earlier portion of the period under consideration the necessity for prompt measures in such cases was not fully recognised; but in December, 1845, the arrears having reached the large amount of 6726*l.*, it became necessary to take decisive steps, and in the following year the names of 789 members were struck out of the Society's books. The necessity that had thus arisen for purging the list of the names of those whose membership was only nominal, will explain the apparently large falling off in the Society's numbers which took place in 1847 and on one or two subsequent occasions. After making these deductions, it will be found that the Society's list of *subscribers* has varied but little during this long period, and that the average number has been about 5000.

Column 3 shows the receipts from annual subscriptions and the compositions paid by life members. The explanation given of the figures in column 2 will also account for great fluctuation in the amounts received under this head. In 1860, for example, no less than 2165*l.* of arrears were paid up. Without this explanation it would be strange indeed to find that the subscriptions received this year more than doubled those of 1859, though the number of members had varied but little. In order, therefore, to form a fair estimate of the Society's income, it becomes necessary to take an average of the whole period, which shows an annual revenue from this source of 5491*l.*

The only other source of permanent income consists of the dividends on the investments which the Society has been able to make from time to time in government securities. These dividends appear in column 4, and, adding the figures in this to those in the preceding column, we arrive at the totals in column 5, which show that the society has possessed an average gross income of 5800*l.* per annum.

Turning now to the expenditure side, we find in column 6 that the whole cost of management has been defrayed for 1735*l.* per annum, including the repair and maintenance of the house in Hanover-square, also rates, taxes, salaries, office charges, and sundries.

The net cost of the Journal is given in column 7. This is made up of the charges for paper, printing, and advertising, payments for prize essays and literary contributions, including the editor's salary, but deducting the proceeds of the sale of the Journal. It is satisfactory to find that the average charge on account of the Journal for the last ten years has been less than the average annual cost during the preceding ten, notwithstanding the additional payments for editorship during

TABLE A.

Year.	Number of Members.	Receipts.			Expenditure.			
		Subscriptions. — Including Compositions of Life Members.	Dividends on Stock.	Total.	Management.	Journal.	Chemical and Veterinary Grants.	Total.
1.	2.	3.	4.	5.	6.	7.	8.	9.
		£.	£.	£.	£.	£.	£.	£.
1841	4,595	5,818	200	6,018	1,882	1,611	..	3,493
1842	5,834	5,884	214	6,098	2,087	1,543	..	3,630
1843	7,000	6,628	245	6,873	2,742	1,242	..	3,984
1844	6,927	7,117	320	7,437	1,826	2,095	..	3,921
1845	6,933	6,342	251	6,593	1,791	1,611	..	3,402
1846	6,971	7,040	221	7,261	2,052	2,891	120	5,063
1847	6,391	6,365	271	6,636	1,676	2,126	310	4,112
1848	6,335	5,211	312	5,523	1,635	1,765	430	3,830
1849	5,512	6,372	280	6,652	1,622	2,059	450	4,131
1850	5,261	6,083	321	6,404	1,605	1,976	413	3,994
1851	5,121	5,953	321	6,274	1,349	1,715	600	3,664
1852	4,981	5,244	334	5,578	1,482	1,710	700	3,892
1853	4,923	4,801	327	5,128	1,402	1,794	826	4,022
1854	5,177	5,053	335	5,388	1,429	1,327	606	3,362
1855	4,882	3,449	261	3,710	1,763	1,224	691	3,678
1856	4,979	5,156	259	5,415	1,962	976	600	3,538
1857	5,068	3,728	265	3,993	2,115	1,119	817	4,051
1858	5,146	5,339	282	5,621	1,699	1,563	472	3,734
1859	5,161	3,027	289	3,316	1,255	1,586	625	3,466
1860	5,165	6,398	319	6,717	1,592	1,610	675	3,877
1861	4,633	4,789	425	5,214	1,537	1,723	921	4,181
1862	4,823	5,463	505	5,968	1,949	2,139	953	5,041
1863	5,183	5,050	478	5,528	1,459	1,806	695	3,960

the last four years, and the extra cost (400*l.*) of a double number in 1862.

Column 8 shows the amount annually voted for chemical and veterinary investigations and lectures. These amounts were exceptionally large in 1861 and 1862, in consequence of special investigations ordered by the Council on *Cheesemaking* and the *Rot in Sheep.* The average amount devoted to these departments of science during the last fourteen years has been 685*l.* per annum.

Country Meetings.—Table (B.) gives the financial statistics of the Society's Country Meetings. In column 3, we find the amount annually awarded in prizes. For the first seven years (1841-47) the variation is but slight, the average amount being 1320*l.* During the next ten years (1848-57) the prize-list was increased fully 25 per cent., the average being 1678*l.* At the Chester Meeting a further increase of 25 per cent. was made; and, excluding Battersea on account of the anomalous character of a metropolitan Meeting, the average of the five years 1858-63 was 2130*l.* These additions to the Society's prize-list have been easily provided for out of the increased receipts whenever the Meetings have been held in populous districts; and although it would be foreign to the policy and objects of the Society to confine its Country Meetings to those districts where large receipts may be expected, it is yet satisfactory to feel that whenever its funds may be somewhat heavily taxed in order to stimulate a backward and thinly-peopled district, the Society can always make up its leeway by holding a Meeting in the heart of our manufacturing or mining population.

The general result of the 23 Country Meetings here tabulated cannot be considered otherwise than satisfactory; for, though their whole cost, exclusive of prizes, has been 134,616*l.* (column 4), the receipts, on the other hand, have exceeded that amount by 7577*l.*; so that the Society has not drawn on its funds to defray any part of the cost of the Annual Shows except the amount awarded by them in prizes; and towards meeting this charge the above-mentioned balance of 7577*l.* has been received, leaving the net sum to be provided by the Society 33,078*l.*, or 1433*l.* per annum.

This table also gives conclusive evidence of the increasing attendance at the Society's Annual Shows. The average receipts at the Country Meetings

	£.
For the 7 years 1841 to 1847 having been	4140
" " 1848 " 1854 "	5009
For the last 7 years (excluding Battersea)	8565

TABLE B.—COUNTRY MEETINGS.

Year.	Place.	Prizes.	Expenditure exclusive of Prizes.	Total Expenditure.	Total Receipts.	Receipts in excess of Expenditure.	Expenditure in excess of Receipts.
1.	2.	3.	4.	5.	6.	7.	8.
		£.	£.	£.	£.	£.	£.
1841	Liverpool	1,220	5,052	6,272	4,106	..	2,166
1842	Bristol ..	1,233	4,775	6,008	4,202	..	1,806
1843	Derby	1,463	5,091	6,554	3,390	..	3,164
1844	Southampton	1,335	5,736	7,071	4,929	..	2,142
1845	Shrewsbury	1,259	5,406	6,665	3,670	..	2,995
1846	Newcastle	1,391	4,866	6,257	4,119	..	2,138
1847	Northampton	1,338	4,863	6,201	4,565	..	1,636
1848	York	1,700	5,957	7,657	4,831	..	2,826
1849	Norwich ..	1,951	4,352	6,303	4,345	..	1,958
1850	Exeter ..	1,725	4,845	6,570	4,941	..	1,629
1851	Windsor ..	1,870	5,032	6,902	5,608	..	1,294
1852	Lewes ..	1,637	5,066	6,703	3,485	..	3-218
1853	Gloucester	1,666	5,910	7,576	5,493	..	2,083
1854	Lincoln ..	1,510	5,856	7,366	6,364	..	1,002
1855	Carlisle ..	1,526	5,363	6,889	6,029	..	860
1856	Chelmsford	1,600	5,728	7,328	5,346	..	1,982
1857	Salisbury ..	1,595	4,893	6,488	6,142	..	346
1858	Chester ..	2,156	6,975	9,131	10,312	1,181	..
1859	Warwick ..	1,689	5,779	7,468	8,902	1,434	..
1860	Canterbury	1,942	5,943	7,885	5,879	..	2,006
1861	Leeds	2,317	6,754	9,071	13,542	4,471	..
1862	Battersea ..	3,980	11,814	15,794	12,160	..	3,634
1863	Worcester	2,552	8,560	11,112	9,833	..	1,279
		40,655	134,616	175,271	142,193	7,086	40,164

The foregoing account of the Society's affairs shows that during the last twenty-three years it has received the steady personal support of 5000 of the leading agriculturists of the kingdom, and that, including the Country Meetings, the total receipts have been 12,000*l.*, and the total expenditure 11,500*l.* per annum, the balance having been invested as a guarantee fund to meet any temporary emergency.

On a review of the whole period, the Council may, therefore, fairly claim—1st, That the result of their management has been to place the finances of the Society on a sound and satisfactory basis; and 2ndly, That when tested by the results of their annual Exhibitions of Stock and Implements, the course pursued by the Society is shown to have secured *increasing popularity* and *steady progress.*

Improvement of Agricultural Machinery.—Having thus far confined our attention to the position of the Royal Agricultural Society itself, we proceed to trace its connexion with the rapid development of British agriculture, which is so evident to everyone connected with rural pursuits, and yet is so difficult to measure or state in definite terms. The first branch of this inquiry which claims our attention is that of Agricultural Mechanics. It is this department which has made the most rapid advance since 1838; and many of the most striking of the recent improvements in British husbandry would have been impossible without the number of new inventions and the more skilled manufacture of all farming implements which have characterized the period in question. In order properly to appreciate the extent of the change which has taken place in farm machinery, it will be necessary to recall the position occupied by this department twenty-five years ago. In 1837 the writer of this article took an active share in the meetings which were held with a view to the formation of the Yorkshire Agricultural Society. These meetings were attended by the late Lord Spencer and a number of the leading agriculturists of Yorkshire from all the three Ridings. The principles on which the Society should be conducted underwent the most thorough consideration and discussion, and the first prize-sheet may be taken to represent the deliberate estimate formed by the best Yorkshire farmers of that day of the relative importance of *Stock* and *Implements.*

The following were the amounts offered as prizes at that Society's first Meeting at York in 1838:—*Stock*, 424*l.*; Specimens of *Wool*, *Roots*, and *Seeds*, 65*l.*; *Essays* and *Reports*, 80*l.* *Implements*, 30*l.* So that out of a total of 600*l.*, 30*l.*, or 5 per cent., was thought sufficient to give "For the invention and

improvement of such Agricultural Implements as may appear to the Committee to deserve reward."

In the following year (1839), the Royal Agricultural Society held its first Meeting at Oxford. The prizes offered were apportioned as follows:—Stock, 740*l.*; Seed-wheat, 100*l.*; Essays, 135*l.*; whilst the amount offered for Implements (with the exception of special prizes for a draining-plough and a gorse-crusher, neither of which were competed for) was confined to the announcement, "For any new Agricultural Implement such sum as the Society may think proper to award;" and a contingent interest in the sum of 50*l.* offered for *Extra Stock, Implements, Roots,* and *Seeds.* The value of these rather problematical offers was ascertained at the time of the Show, when the Judges awarded *Five pounds* to the prize implements, *with one Gold and three Silver Medals.* Estimating these medals at their cost to the Society, about *one and a half per cent.* of the money given away at Oxford was awarded to the Implement Department!

At the Society's Cambridge Meeting in 1840, above 1000*l.* was offered in prizes, but the *Implements* rather lost than gained ground, the special prize of 50*l.* for a draining-plough having been withdrawn, whilst the other prizes for Implements remained as in the Oxford prize-sheet. *No money and only seven medals* were awarded to the Implements at the Cambridge Meeting!

The subordinate position occupied by Agricultural Machinery at the time of these Meetings is thus sufficiently evident; but a striking corroboration of the fact is to be found in the first Essay read before the Society (March 13th, 1839) by that accomplished writer the late Mr. Pusey. The title of the paper was, 'On the Present State of the Science of Agriculture in England,' and no one was more capable than Mr. Pusey of justly estimating the relative importance (according to the ideas of the day) of the numerous subjects discussed in that valuable and exhaustive article.* It is curious to find that the only implements there alluded to were the plough and the harrow, the turnip-slicer and the thrashing-machine, with the exception of the following paragraph on the drill, which sounds so strange in the ears of a farmer of the present day that it seems barely credible that it should have been penned by one so thoroughly conversant with his subject at so late a date as 1839. "*The use of another instrument, the drill-machine, a more complicated one, by which the seed is laid in regular rows, has lately become frequent in Southern as well as in Northern England; though it has established itself so slowly, that for a long time travelling machines of this kind have made yearly journeys from Suffolk as far as*

* 'Journal,' vol. i. p. 1.

Oxfordshire, for the use of those distant farmers by whom tl services are required." •Volumes of proof of the complete re lution which has taken place in farming implements since 1ξ would not be more convincing than the simple announcem that Mr. Pusey, in his inaugural address to the members of Royal Agricultural Society, thought it necessary to inform th that the drill was a machine by which *the seed was laid in regu rows;* or than the surprising fact which he records that Sufl drills have actually perambulated the half of England since accession, *not of good Queen Bess, but of her Gracious Maj Queen Victoria!*

The insignificant position allotted to farming implements li more than twenty years ago having now been sufficiently sho a few short extracts from the records of the Society will pr the extent of the advance which has subsequently taken place

At the *Oxford* meeting the portion of the catalogue devotec implements contained the names of *twenty exhibitors*, and occu *less than one page octavo!*

At *Cambridge* there were thirty-two exhibitors, and the desc tion of the implements occupied a page and a half of the c logue. Yet the Cambridge show of implements was in 1 considered a great success, and the report (which bore the sig ture of three most competent judges and expressed the gen opinion of those present), stated that "*beyond controversy, suc selection of implements was never before collected in one showyar*

The Society's last show was held at Worcester, and tl were assembled 282 exhibitors of implements, who sho 5839 articles (excluding duplicates), and the catalogue describ them formed a thick octavo volume of 457 pages. There w 135 *steam-engines*, 11 *traction ditto*, 12 *steam-ploughs*, 29 *ste cultivators*, 57 *steam thrashing-machines*, and 45 *reaping mowing-machines*. These articles have been selected as n illustrative of progress, and their bare enumeration would l been sufficient if the object of the writer had been simpl furnish some statistical proof of the recent development of agri tural mechanics in this country. Unfortunately, however, tl exists a fundamental difference of opinion between the mana of the Society and several of the leading implement-mal respecting the proper mode of conducting shows of impleme and, when recording the great success of the Worcester E bition, the occasion seems a suitable one for considering this q on. The benefits conferred upon agriculture by the talent enterprise of the makers of implements have been so great pains should be spared in the attempt to reconcile these licting views; or, should that prove impossible, it is at all ev desirable [illegible] brief space to a careful statement of

reasons which have always been considered conclusive against adopting the change of system which they advocate.

The controversy is not new. Several years have elapsed since a few of the leading firms first objected to the prize system, and a sort of crisis took place at the Canterbury meeting in 1860; but as the object of the present remarks is not to put any one in the wrong for what is past, but for the sake of the future clearly to ascertain which view is right, no note of triumph shall be sounded on account of the result of that trial of strength, and the arguments *pro* and *con* shall be as fairly considered as if no differences had ever arisen on the subject.

The Prize System.—The fullest and best statement that has yet been made of the views of the implement-makers is contained in a paper by Mr. J. C. Morton, on the Helps and Hindrances to Agricultural Progress, read at the Society of Arts on the 9th of December last. That gentleman has brought to the consideration of this question the extensive information and thorough impartiality for which he is distinguished, and throughout his remarks it is apparent that he is actuated by no carping or fault-finding spirit, but by a *bonâ fide* wish that these important exhibitions should attain their maximum of efficiency. His arguments are therefore entitled to the most careful consideration, and in dealing with them it is satisfactory to feel that we have the whole case before us.

It must be premised that the *prize system* which is called in question is the system of subjecting all implements exhibited to actual trial, in order to award prizes to those which acquit themselves the best; the alternative being that the implements should be *inspected* but not brought into *competition* with others of their own class in such a way as to enable the judges to pronounce any opinion on their *comparative* merit. Mr. Morton contends that the trials are inadequate, partly because the land in July is not in a fit state for the purpose, partly because sufficient time is not allowed the judges for forming their decisions. He further argues that "the award of a prize confers too great *i. e.* too abrupt a distinction" between the winning implement and others whose performances are almost equally good.

The argument founded on the state of the land is not entitled to much weight. Having attended seventeen of the Society's country meetings, we have sufficient experience of the weather on such occasions to assert that though the trials are sometimes interrupted by wet, and sometimes rendered difficult by drought, yet that, taking into account temperature and length of day, as well as the state of the land, no month is, on the average, so well fitted as July for carrying out these trials; and that, unless the

drought or the wet be excessive, it is desirable to have a variety of weather, as it gives the opportunity at one time of rewarding an implement which makes good work on hard dry land, and on another occasion one which is not stopped by a few showers of rain. Decisions arrived at under alternations of drought and wet can be commended with all the more confidence to practical farmers, with whom weather difficulties are the ordinary conditions of every-day life.

The second objection, founded on the shortness of the time, is a more grave one. It may be readily conceded that when a class is under trial in which the entries are numerous and where several possess nearly equal merit, it is difficult to test each one so thoroughly as to give the judges perfect confidence in the correctness of their awards. It will also occasionally happen in bad weather or at the close of a hard day's work that trials are more hurried than is desirable. But whilst freely admitting that trials of implements are not *perfect* or *infallible*, we entirely deny that this is sufficient reason for giving them up. The question is not, Do the judges ever make a mistake? but, Are they not right in a large majority of instances? and that this is the case is sufficiently proven by the constantly increasing number of those who are guided in their purchases by the judges' decisions.

The third objection is of a totally different character: it is grounded on what Mr. Morton calls the "excessive character of the prize system." To use his own words, "the prizeman wins, the rest are nowhere." Here again it must be admitted that it not unfrequently happens that two implements are so equal in their performances as to make it difficult to decide between them, yet one only receives the prize for that season. This is an undoubted hardship to the maker of the losing implement, though frequently much mitigated by the award of a medal or special commendation by the judges. It is also true that when implements are nearly equal, the maker who has the cleverest ploughman or drillman will probably win. The state of the ground, too, may on some particular occasion give the preference to an implement which in an average season would have been beaten by one or more of its now distanced competitors. These are the inevitable drawbacks to any competitive system. Precisely the same difficulties occur in horse-racing. Two horses run neck and neck for the Derby; but, on passing the judge's stand, one jockey is strong enough or clever enough to lift his horse bodily and win by a nose. No one remembers that the second horse ran the race in precisely the same time as the first; but the three inches won by the jockey bring thousands to the fortunate owner, and hand down the horse's name to posterity as a Derby winner. Again

the course is unusually hard or deep, and the best horse is passed by one which he has beaten before and will beat again under any ordinary circumstances. Yet, notwithstanding these extreme cases, no one denies that, as a general rule, the best horse wins the race, and, above all, no one suggests that *examination by competent judges* would be a satisfactory mode of ascertaining the speed and bottom of a race-horse.

The mistake, as it appears to us, which is committed by the opponents of the prize system, is that they fix their attention too exclusively on the defects and shortcomings from which no system is free, and thus lose sight of the sterling advantages which belong to it, and which have been so long enjoyed that they are taken as a matter of course. For instance, Mr. Morton quotes an instance from the Warwick meeting, where a new man appeared as ploughwright and took many of the principal prizes. This he considers unjust to other makers, whose ploughs made nearly as good work. He adds, that it would not make a difference of one penny an acre whether the prize plough (Messrs. Hornsby's) or Messrs. Howard's or Ransome's were adopted as the implement of the farm. This is probably true; but if there had been no competitive trials, how would it have been known that a few of the leading makers' ploughs were so equal that they might be used indifferently? Would not buyers of implements, instead of confining their attention to those which at Warwick and other shows had won the Society's prizes, have been just as likely to have bought the rubbish which year after year has been steadily eliminated from the sterling implements? Had there been no distinctive marks of ascertained merit, many a worthless implement would by the help of red and blue paint have made a brave show, and, if puffed by a plausible salesman, would for a season or two have sold as well as the best, until disappointed buyers found that they could place no dependence on the machines exhibited, and *the Society's shows would have justly forfeited their prestige, because they had previously lost their usefulness.*

What was the case at the Cambridge meeting which was held before the prize system could be said to have commenced? The great feature of the implement-yard was what would be termed in Kensington English Messrs. Ransome's *Trophy*. How was it described in the report of that meeting? "A bank of their ploughs (eighty-six varieties) were arranged and elevated on planks to the height of at least 20 feet, and struck the eye of the beholder as he entered the yard." We can give the actual experience of a would-be buyer on this occasion, who was at once attracted to Messrs. Ransome's stand, but found himself utterly puzzled by the eighty-six varieties above named. There were no prize-cards or medals of

the Society to guide his judgment, and he felt himself so enti in the hands of the salesman in attendance, that he mad purchase at all. In this case he would no doubt have been q safe in Messrs. Ransome's hands; but had the Society ado the "*Trophy*" instead of the "*Trial*" system, the competi between rival makers, which has caused such persevering ef to be made for the production of winning implements, wc have been equally active in getting up imposing displays of w grouped machines; and it requires no great effort of imagina to realize the utter bewilderment of a practical farmer attend the Leeds or Worcester show to select and order impleme walking down mile after mile of the sheds (as they would h been), all filled with equally imposing-looking wares, and hear each in succession described by stentorian lungs as the *best*, *newest*, the *only* implements worthy of a moment's notice.

We shall be told that in some few instances (the Bath West of England Society is quoted by Mr. Morton) the c petitive system has been abandoned without any injurious co quences. The management of that Society is in very able har and if they continue their present system it will be because t find it answer; but if not only the Bath and West of Engla but all the local societies in Great Britain, abandoned the c petitive system, it would not affect the argument in the smal degree. As long as the *National* Agricultural Society contin periodically to devote its funds and its energies to an effici trial of all agricultural machines which seek distinction, so l will the *failures* find it as impossible to obtain purchasers in showyard of the Bath and West of England Society as in tha the Royal Agricultural Society itself, and so long also will *prize-winners* be regarded with attention at every agricult meeting in the kingdom.

Mr. Morton mentions that there have been instances where bestowal of prizes or the suggestions of the Royal Agricult Society's judges have been positively injurious to the efficie of certain implements, and consequently to the trade of tl makers. We shall not for a moment question the accuracy his statement, nor is there any antecedent improbability in supposition that out of the many thousand decisions and opini which have been given by judges at the Society's various me ngs, some may have been erroneous, and some useful suggesti nay have been so badly carried out in practice as to have resul n failure; but the general tenor of the communications made mplement-makers to the stewards and judges has been so co etely of an opposite character—so many exhibitors have b grateful fr hints, and have attributed more or less of their co

mercial success to the instruction and corrections received in the Society's showyard—that we cannot but consider the cases mentioned by Mr. Morton as altogether exceptional.

Many of the leading manufacturers are undoubtedly opposed to the continuance of competitive trials, and their view of the subject is, we believe, somewhat of the following kind. They have devoted their time, talents, and capital to the improvement of agricultural machinery. They have been eminently successful, and they think that having arrived at this pitch of excellence, they might be trusted to furnish sterling articles in future without being put to the trouble and expense of constantly fighting to maintain their position, with the additional mortification of being occasionally beaten by an implement which they honestly believe to be inferior to their own. With these feelings they are naturally disposed to be hypercritical with regard to the Society's trials, and to magnify unduly every little error or mistake.

Taking a broad view of the question as it affects the implement-makers: what do we find to be the result of three-and-twenty years' experience? Are the firms of old standing continually driven out of the trade by new men? Quite the reverse. No doubt many new men have taken up the business, and some few, like Messrs. Clayton and Shuttleworth and Messrs. Fowler, have in a comparatively short time taken their place among the very first. But it is equally true that the repeated decisions of so many different judges have made more and more clear the indisputable fact that amongst the *most improved* and *best-manufactured* implements in the various classes are always to be found those of the original leaders in this department, Messrs. Garrett, Hornsby, Howard, Ransome, &c. &c. *Can these gentlemen then be serious in maintaining that the trials are so hurried and inadequate as to be unworthy of the confidence of the public?* We feel persuaded that on reconsideration they will lean rather to the more general opinion that on the whole these decisions are not far wrong.

But though the old-established firms have been able to hold their own against all legitimate competition, it is by no means equally clear that in the absence of trials they would be successful in protecting their business from the inroads of plausible charlatans, who are only kept in the background at present by the impossibility of their winning prizes. By abolishing competitive trials the outsiders would have a clear course, and the usual results would probably follow the tempting announcement of *the best quality of work and materials at half the usual prices.*

It thus appears that the prize system is not without compensation to the implement-makers for some unavoidable annoyances, but if the question be treated solely with a view to the interests

of the farmer the case is still more clear. The advocates for the abolition of the trials of the Royal Agricultural Society, mean of course that the precedent should be followed by all local agricultural societies, otherwise it would simply amount to a proposal that the National Society should abdicate its functions in favour of lesser local societies, who would with inferior means have to grapple with a difficulty which by the hypothesis is beyond the strength of the strongest. We will suppose therefore that competitive trials were generally abandoned. For a year or two, perhaps more, the want would not be greatly felt. *The marks of the prize system would not have worn out*, but after a time, new wants and new inventions would have brought into the field a new generation of implements, and as there would be no opportunity of comparing the efficiency of the productions of the whole country and conferring on the winners a national reputation, the natural tendency to patronise neighbouring and local makers would resume its sway. Certain implements would become famous in particular districts, and if the intelligence of the age would allow of so long a suspension of what would soon be perceived to be a national requirement, we should at length relapse into a similar state to that which existed in 1839, when the plough of Yorkshire was a totally different implement from the plough of Kent, and the Suffolk drill was only a visitor in the counties of Berkshire and Oxfordshire.

It is important when considering this question to keep prominently before us the main object of Implement Shows, and the following sentences extracted from the Reports of the Society's Exhibitions of Implements in 1848 and 1849 are quite in point:—

"The principal advantages to be derived from Shows of Implements may be classed under three heads, of which the first and most important is, that the awards of prizes should point out to every farmer who enters the Show-yard the best implements in their respective classes which the kingdom produces. Farmers, as a body, have neither the means nor the leisure required for travelling about to visit the manufactories of the various implement-makers; nor, if this were practicable, could they safely decide on the comparative efficiency of their respective productions by merely seeing them in the makers' yards. It is, therefore, a great advantage to the farmers of any district to have a large show of implements brought into their neighbourhood, especially when the best of each class are pointed out to them by competent judges after a fair trial." * . . . .

"The attention of some of the leading members of the Society

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* 'Journal,' vol. ix. p. 378.

(especially of the late lamented Mr. Handley) was earnestly directed to the improvement of this department, and they soon perceived that little was gained by collecting implements in a Show-yard for people to gaze at, unless an adequate trial could be made of their respective merits. To attain this end great exertions were made, and every improvement in the mode of trial was followed by so marked an increase in the number and merit of the implements brought forward at subsequent shows, as to prove the strongest incentive to further effort. . . . . The additional amount offered in prizes at the later meetings has undoubtedly assisted in creating this great increase of competition, but it cannot be considered the principal cause, since the implement-makers are unanimous in declaring that, even when most successful, the prizes they receive do not reimburse them for their expenses and loss of time. How, then, are the increased exertions of the machine-makers to be accounted for? Simply by the fact that the trials of implements have gradually won the confidence of the farmer, so that, when selecting implements for purchase, he gives the preference to those which have received the Society's mark of approval. . . . .

"It thus appears that concurrently with the extension and improvement of the trials a corresponding increase and improvement has taken place in the exhibitions of implements; and though it is difficult to *prove* that the one has been the cause of the other, still the probability that such is the case almost amounts to certainty, when it is found that classes of implements which are so faulty in construction as to be strongly animadverted on by the Judges at one meeting, are at the next nearly free from those defects which had been previously pointed out. . . . . If the foregoing reasoning be correct (and the facts on which it is founded will not admit of question), the Society may fairly claim to have been, in great measure, the authors of the very rapid improvement made of late in almost every kind of agricultural implement."*

If this could be said in 1849, it may be affirmed with much more confidence in 1864. The general diffusion of the best implements at the present time makes the proof much more complete, and much more easy to obtain. Should any one be sceptical, let him visit the premises of some improving farmer. Without doubt he patronises steam, and thus economises horse labour—thrashes his grain in less time—dresses it better for market—leaves less in the straw. He also chaffs his fodder, slices or pulps his roots, and crushes his horse and cattle corn;

* 'Journal,' vol. x. p. 528.

the result being economy of feeding material, saving of manual labour, and improvement in the condition of his live-stock. Is it seed-time? His drills are so accurate in their work that the horse-hoe can follow when the weeds are yet so young that they are exterminated by the passage of the knives, yet without risk to the young corn. The iron harrows, before and after sowing (zigzag, diagonal, or chain), do more work at one turn than the old country blacksmith's implements did at two or three. If the land be too light, there are the smooth-roller, the fluted-roller, and the clod-crusher. Should it be hay-time or harvest, there are the mowing and reaping machines, the hayspreaders, the horse-rakes, the steel forks, the improved harvest-carts, the Dutch barn, and the rick-stands. This *resumé* might be extended to a tedious length, but it is unnecessary. We have one question, and but one, to ask when the inspection is completed. In this farmer's whole set of machines and implements, *is there one which has not received a prize or medal of the Royal Agricultural Society?* If not, or if, as we believe to be a common case, the exceptions are only such as to prove the rule, then are we in a position to point out not only what an important influence has been exercised by improved machinery in bringing about the agricultural progress which has been realised of late, but also what a large share the Royal Agricultural Society's Shows have had in producing this gratifying result.

Steam.—The influence of steam as applied to agricultural machinery still remains to be noticed. Nothing could have been more antecedently improbable than that the costly steam-engine, with its delicate valves, its niceties of adjustment, and its tremendous power for good or for evil, could safely have been entrusted to the care and control of any one but a trained engineer. So thought and so reasoned most thinking men twenty years ago; and of all the working-classes the *agricultural* labourer would have been thought the least likely to be either able or willing to lend a helping hand. How did he receive the introduction of the first piece of machinery which became common on the farm? All who have attained the age of fifty can recollect the quasi-rebellion which, under the name of "*Swing riots*," raged in the southern counties of England when thrashing-machines began to make their way there. The labourers rose in full force to resist this aggression on their rights with fire and flail. Yet in twenty short years the horse thrashing-machines may be said to have come and gone, and the intelligence of the labourer has so advanced meanwhile, that the most labour-saving invention is no longer followed with threats and sullen looks; and of all the obstacles to the introduction of steam-machinery, the least has

been the want of an intelligent workman to take charge of the engine.

The rapidity of the change has been quite unexampled in agricultural history. At the Newcastle Show, in 1846, only one steam-engine was exhibited, which went unrewarded because it had been previously shown and had received a prize; and at a subsequent Meeting the writer can recollect a grave discussion between the Stewards as to the safety of allowing steam-engines to get up their steam in the Society's show-yard. Yet at Worcester there were 135 steam-engines; and one of the successful exhibitors on that occasion has informed us, that though in 1845 he made only one steam-engine, and not one steam thrashing-machine, he has, in the four years 1859-1862, turned out an average of 488 engines and 373 steam thrashing-machines per annum! Since 1852 he has sold enough steam-engines to supply each member of the Royal Agricultural Society with one. He adds, that in the last ten years the average horse-power of the engines made by him has risen from 5·52 to 7·87, an increase of 42 per cent. If the engines furnished by all the makers in the same time could be summed up into a grand total, it would be seen that already many thousands of steam-engines have been purchased for agricultural work; showing clearly that *on the farm as well as in the factory the reign of steam has commenced.*

The truth of this assertion is every day becoming more apparent. In the barn and in the stack-yard the steam-engine is already without a rival. It would be sheer waste of time to give any detailed proof of the superiority of steam to any other available power for barn-work, or any calculation of the exact number of pence per quarter thus saved by the farmer in preparing his grain for market. The feats performed by steam in the way of thrashing, grinding, chaffing, pulping, slicing, have been already chronicled so fully and so frequently of late years as to convince all those who will allow themselves to be convinced by argument. To those who will not, we commend the stubborn fact already mentioned—that *five thousand steam-engines have been sold by one maker since* 1852!

One of the main obstacles to the general introduction of steam-machines was their heavy cost, which was quite disproportionate to the means of a small farmer or the quantity of work to be done on his farm. This difficulty has been surmounted by the intervention of the village capitalist, who has made a comfortable livelihood by purchasing a machine or two, and letting them out for hire to the small farmers in his neighbourhood. In our own district the farms are chiefly small, but thrashing by steam is all but universal, whilst the farmers' own horse-machines are standing idle and fast rusting into oblivion.

Seeing then that steam has ensconced itself in our homesteads and after ejecting most of their previous occupants, is now wagin war with their most ancient denizens, the ploughs and the harrow of "long, long ago," it is surely not premature to inquire the wh and the wherefore of this great disturbance. No common motiv can have induced men of solid character and fixed habit suddenly to buy hundreds and thousands of costly machines whose construction they don't understand, and whose adoptio forces them to change many of their former plans, and render useless much of their former expenditure. The answer is a hand. One moving cause, and only one, is powerful enough fo the purpose, and that cause is *competition.* The British corn grower is competing with the corn-growers of all nations, an this competition is continually increasing in intensity. The whol world is, in fact, running a race to secure the best market fo their surplus productions; and the repute of our wealth and th universality of our commerce are year by year turning the curren more and more towards our shores. The cost of transport to th place of shipment, added to freight and port-dues, once forme a fair set-off against the cheapness of land and the superiority c climate enjoyed by the foreign corn-grower; but the construc tion of railways abroad and the substitution of steamers fo sailing vessels are continually diminishing this margin, and th conditions of the problem which presents itself to the Britis corn-grower are these:

The increased area from which supplies are now drawn to th British market, and the diminished cost of transport, have s lowered the average price of grain as to make it necessary fo the English farmer to reduce his outgoings, in order still t grow corn with profit. These outgoings principally consist c three classes of payments: *rent, wages,* and *farming expense* Has he any prospect of a reduction of *rent?* Is it not notoriou that the competition for farms is such that the constant tendenc is towards a rise rather than a fall in rents? Can *wag* be lowered? Is it not equally notorious that wages have in creased *considerably* in the last ten years, and that they als have a tendency still to rise? The only available expedien then, appears to be, to reduce the cost of cultivation; and thi quarter appears the more hopeful when it is borne in mind tha there are two great advantages available in this country of whic until of late the farmer has made little use, viz., *the superiorit of British machinery* and *the abundance of British capital.* Thes have been freely drawn upon by his rivals for the constructio of foreign railways, and for the improvement of both Britis and foreign shipping; but on the other hand, the implemen makers, the joint-stock banks, and the loan-societies have com

to the aid of British agriculture, and have rendered possible the unusual expenditure now being incurred for the purchase of improved machinery, so that this outlay, though apparently rash and hazardous, is really a work of necessity, *an indispensable condition of the British corn-grower's holding his own.* Few farmers probably have reasoned the matter out in this way; but with characteristic sagacity and pluck they have rightly read the signs of the times, and resolutely adopted the remedy.

Steam-Cultivation.—The advantages of steam-cultivation, when applied in suitable situations, were well described by Mr. Ruck, of Castle Hill, Cricklade, in a clear and instructive statement, made last May at the opening of a discussion on the subject at the Society's rooms, Hanover-square.* If all farms were as well adapted for the steam-plough as that of Castle Hill, and if all farmers possessed as much capital and energy as Mr. Ruck, little more need be said on the subject than to wish them every success in their new career.

A large portion of England is, however, let in small holdings, and mapped out in fields of every imaginable size and shape; and it is evidently impracticable in such cases to introduce steam-cultivation as practised by Mr. Ruck, and other large occupiers, whose farms have been duly prepared for the new system. It therefore becomes a question of great interest whether steam-cultivation can only become general when the existing large number of small farms shall have been consolidated into a small number of large ones. In the first place, it is necessary to consider what is implied by the consolidation of farms. It seems but a simple matter for a landowner to issue the fiat. *Let half-a-dozen small farms be consolidated into one large one;* the first idea realised being that some miles of old crooked fences and some scores of hedgerow trees would disappear, and be replaced by a few straight fences, laid out with special reference to the requirements of steam-cultivation. So far all would be serene: land would be gained by the removal of the fences; and the fewer the trees which are tolerated on arable land the better for the tenant, the proprietor, and the public.

The next step is not such plain sailing. Pulling down six homesteads, ill-arranged and incomplete though they may be, and building a good house and set of farm-offices, are expensive operations, and it is neither agreeable nor convenient to repeat them too often in these prosaic days, when Aladdin's lamp is no longer available even to the most devout worshipper of the Prophet. But the

* 'Journal,' vol. xxiv. p. 610.

worst remains to be told. Five tenants are turned out; one onl is promoted, if, indeed, any one of the six be found fitted b capital and capacity for doing credit to the new arrangements *What are these men's offences?* and *what are they to do for livelihood?* The landlords of England will require satisfactor answers to these questions before they will pass any sweepin sentence of expatriation upon hard-working, deserving tenants even to make room for the steam-plough. No doubt opportunitie frequently occur when, without harsh measures, farms may b consolidated, and this process is quietly progressing in a natur and satisfactory way; but *if small farms are never to be cultivate by steam, it will be long, indeed, before steam-cultivation becom general.*

We are by no means disposed to take a desponding view of th obstacles to be surmounted in the introduction of steam-worke implements on small occupations. Doubtless they are great than the difficulties which stood in the way of steam-thrashin on such farms, but these were considered insurmountable a fe years ago; and there is no want of inducement to make th attempt, as it is rapidly becoming apparent that even *on ligh land steam-cultivation will pay*, and that *clay cannot be thoroughl worked by any other means.* It was at one time believed th subsoiling clay by horse-power would effect the deep and pe fect tilth which is so great a desideratum and so difficult task on such land, and when this was the current belief, im proving clay-land farmers did not hesitate to incur the heav expense of 20*s.* to 30*s.* per acre to stir and break up the land t the desired depth. The result was neither permanent nor pr fitable; but it was not the heavy cost per acre which cause subsoiling clay to be discontinued. *That* was known when th subsoil-plough was purchased. It was the slowness of th progress, and the injury caused by the trampling of so man horses, which prevented the operation from succeeding. Steam cultivation is free from these objections; and even on sma farms it can be done at much less cost than subsoiling by hors or oxen.

The only real difficulty is the amount of force required to cu tivate strong land to a sufficient depth. The best authoriti recommend an engine of 12 or 14 horse-power for this worl With such a command of power the strongest clay may be broke up to a sufficient depth steadily and uniformly, or it may b well *stirred, sown,* and the *seed covered,* at one operation. Ther can be little doubt that in this way the work can be done in th most perfect, and perhaps also in the most economical way; an rge farmers with sufficient capital will probably never regr ing made the outlay requisite to give them full command

their work. But the desideratum of the present day is to ascertain the best mode of utilizing, for the purposes of cultivation, the many thousand engines which have been already sent out to farmers or small capitalists, and whose average nominal strength is probably about seven horse-power.

Two ways of accomplishing this may be mentioned. The first is, *to reduce the work to be performed.* Instead of using a plough turning three or four furrows, it is perfectly practicable to use one turning two only, and all the other implements may be reduced in proportion. The reduction in the amount of work done in a given time would not be important on small farms; and though the owner of the engine would have to charge a higher rate per acre, it would still answer to the farmer to pay for the use of a steam-plough at particular seasons, in order to break up some unusually stubborn fields, which were quite beyond the strength of his team.

The other plan would be, to combine two engines of moderate calibre, and thus obtain power sufficient to get through the heaviest kind of work. This method has been introduced by several makers, and their respective modes of applying the power of the twin-engines, either alternately or jointly, has been clearly described in Mr. Algernon Clarke's very able and valuable article on the Progress of Steam-cultivation, in the last number of the Journal.* Hitherto the men who let out steam-thrashing machines have feared to take up steam-ploughing, partly because the demand has not yet become sufficiently general, and partly because a 12-horse engine is too costly, and unnecessarily powerful for the work on which they would be engaged for the greater portion of their time. Steam-ploughing, even when it became general, would not be sufficiently continuous to pay, unless the engine could go to some other work when the land was soft; but if at particular times of year one engine could be sent with a two-furrow plough to a small farm, and two engines with a larger cultivating apparatus for a heavier job, the business of steam-cultivation might be profitably combined with that of steam-thrashing.

These two methods would be equally available to the occupier of a small farm as to the owner of engines who lets them for hire. An engine of 7 or 8 horse-power would pay well on a farm of 250 or 300 acres of arable land, if in addition to its services in the barn it could also, when required, plough effectually 3 or 4 acres of strong clay per diem ; and for any work of especial urgency or difficulty, two neighbours might unite their forces, and thus obtain sufficient command of power.

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* 'Journal,' vol. xxiv. p. 362.

A Steam-plough Company was formed in Gloucestershire, in 1860, under very good auspices, but did not succeed, in consequence of the long periods of enforced idleness which occurred whenever the weather was unfavourable. Another company has been formed at Wakefield, in Yorkshire, which hopes to surmount this difficulty, by undertaking steam-thrashing, sawing, grinding, &c., whenever the engines cannot go on the land. The results, so far, are highly encouraging.

The present position of the question seems to be, that on large arable farms steam-cultivation is a decided success, especially where the land is so laid out that the apparatus can be worked in the most effectual and economical manner.

That on farms of moderate size it can also be applied with advantage, by employing ploughs or cultivators which do not require an engine of higher power than can be usefully employed on ordinary barn-work.

Lastly, that even small farms may derive considerable benefit from steam-cultivation, as soon as companies or private capitalists will undertake this kind of work, which they may do with advantage, either by the employment of small cultivators with one engine of moderate power, or by combining two such on the twin-engine principle.

Effect of Free Trade.—The influence of the competition arising from free trade on the demand for improved agricultural machinery has already been pointed out. By the courtesy of the authorities of the Board of Trade, we are now enabled to furnish tables showing the full extent of the competition which British farmers have to meet in their two staple products of corn and meat.

Table (C.) shows the quarters of wheat, barley, oats, maize, peas and beans, and the hundredweights of flour imported in each of the years 1839-1862. Large as these quantities undoubtedly are, we are satisfied that they do not warrant the opinion generally entertained that, since the adoption of free-trade, the importation of foreign wheat and flour has been increasing faster than the consumption—or in other words, that the production of wheat in this country is declining, and that its place is being supplied by importation. It is much to be regretted that on a question of so much interest to the agriculturist, the capitalist, and the statesman, we should have no reliable statistics by which to test the correctness of this opinion. Indirect proof is all that can be adduced. We trust that it will be considered conclusive.

The most superficial examination of the accompanying table will show that a very large increase in the importation of wheat

TABLE C.—GRAIN IMPORTED INTO THE UNITED KINGDOM.

Wheat.	Barley.	Oats.	Maize.	Peas and Beans.	Wheat-meal.
Quarters.	Quarters.	Quarters.	Quarters.	Quarters.	Cwts.
2,638,593	579,405	674,554	9,565	249,822	793,606
1,995,453	625,437	537,805	22,021	287,904	1,552,697
2,409,754	264,654	122,297	4,137	442,253	1,275,656
2,722,305	73,550	302,852	35,866	219,830	1,151,827
932,866	179,414	84,718	516	97,051	440,955
1,097,963	1,025,416	308,126	39,218	261,780	987,774
844,533	367,854	586,860	55,984	265,621	924,256
1,437,336	371,137	794,863	694,184	468,050	3,363,810
2,650,058	772,840	1,706,780	3,614,637	600,964	8,637,377
2,477,366	977,203	930,265	1,577,023	668,160	1,731,974
3,845,378	1,381,008	1,267,106	2,224,459	692,299	†3,349,839
3,738,995	1,035,903	1,154,473	1,277,071	619,720	3,819,440
3,812,008	829,564	1,198,529	1,807,636	417,623	5,314,414
3,060,268	625,540	989,287	1,471,277	477,306	3,865,173
4,915,430	824,068	1,028,409	1,544,483	450,655	4,621,506
3,431,227	552,972	1,014,949	1,349,698	494,843	3,646,505
2,667,702	349,110	1,033,727	1,215,333	458,427	1,904,224
4,072,833	731,412	1,146,848	1,777,813	439,300	3,970,100
3,437,957	1,701,470	1,710,299	1,150,783	465,674	2,178,148
4,241,719	1,661,392	1,856,281	1,750,825	570,006	3,856,127
4,000,922	1,727,855	1,677,585	1,314,303	500,502	3,328,324
5,880,958	2,112,861	2,290,951	1,851,762	754,035	5,086,220
6,912,815	1,400,401	1,859,781	3,090,352	960,330	6,152,938
9,469,270	1,854,944	1,609,816	2,728,791	703,048	7,207,113

* Import duty 1*s.* per quarter from 1 Feb. 1849.
† Import duty 4½*d.* per cwt. from 1 Feb. 1849.

and flour took place in the three last years. The quarters (wheat imported in the first ten years of free-trade ranged f(the most part between three and four millions of quarte per annum, averaging 3,737,906 quarters. The flour import(averaged 3,650,396 cwts; but in 1860, 1861, 1862 the avera; imports of wheat rose to 7,421,014 quarters per annum, or doub the average of the previous ten years; whilst the import(flour reached 6,148.757 cwts., an increase of 68 per cent. Th sudden rise is easily explained. The three years in questi(were years of unusually deficient crops in these islands. A interesting return given by Mr. Morton, in his valuable pap on Agricultural Progress, already alluded to, furnishes the mea: of testing the extent of the deficiency in one of our largest cor growing districts. It is an account of the produce of wheat p acre on a large Fen farm in Lincolnshire for the last twenty-fo years; and shows that, whilst the average produce of the who period was between 38 and 39 bushels per acre, the produce the three years 1859, 1860, 1861 was 26, 24, and 27 bushe respectively—*i. e.*, the produce of these three successive yea was 33 per cent. below the average produce of the farm. The were the three harvests which would influence the importatio of the years 1860, 1861, and 1862, and sufficiently account f their unusual amount. In endeavouring to strike a balance b tween the ordinary increase of importation, consumption, a home production, the calculation would be vitiated by includi these very exceptional seasons, unless it could be extended ov a long succession of years, which, as Free trade commenc(in 1849, is evidently impossible. We shall therefore confi: our comparison to the ten years immediately preceding, and t ten immediately succeeding 1849, leaving out that year as n belonging entirely to either the Free-trade or ante-Free-tra epoch. We shall calculate the wheat-meal as wheat at the ra of $2\frac{1}{3}$ bushels for each hundredweight of flour, and we find th the comparison stands as follows:—

	Qrs.
Quantity of wheat and flour (calculated as wheat) imported in 1839	2,870,061
Ditto in 1859	4,971,683
Increase in 1859 over 1839 .. Qrs.	2,101,622
Average quantity of wheat and flour (calculated as wheat) imported in each of the five years, 1839-1843	2,443,987
Ditto 1855-1859	4,573,047
Average increase .. .. .. Qrs.	2,129,060

		Qrs.
Average quantity of wheat and flour (calculated as wheat) imported in each of ten years, 1839-1848		2,529,037
Ditto, 1850-1859		4,802,605
Average increase	Qrs.	2,273,568

The results obtained by comparing the *first* and *last*, or the *first five* and *last five*, or the *first ten* and *last ten*, of the twenty-one years under consideration, are thus so nearly the same, that no material error can in this case arise from basing our calculation on the comparison between the single years 1839 and 1859, the first and last of the series; the difference in the quantity of wheat imported in those years being 2,101,622 quarters.

The next step is to ascertain the increase of the population in the period under consideration; and this we find, from the Census Tables for England and Wales, to have been 4,127,819. The ordinary estimate of the consumption of bread-corn by a wheat-eating people is one-quarter (of 8 bushels) per head per annum. We have satisfied ourselves by careful inquiry that this is as near an approximation to the truth as can be expected from a rough-and-ready rule of the kind. The population of England and Wales would therefore require 4,127,819 more quarters of wheat in 1859 than would have sufficed in 1839. The increase of importation of wheat and flour (calculated as wheat) in 1859 over 1839 was 2,101,622 quarters. The balance therefore of 2,026,197 quarters of annual supply must have been provided by the increase of our home-grown wheat, or our population must have been *much worse fed than heretofore*, the very reverse of which we know to be the fact.

We do not pretend that this is an accurate estimate, or even a close approximation; but we feel little doubt that it may be taken as the *minimum* increase of our home-grown supply, and that it is, in fact, much below the actual increase if that could in any way be ascertained. That this is so the following considerations will show:—In the first place, the increase of the population is an ascertained fact, and the estimate of eight bushels of wheat per head of annual consumption in England and Wales, which has been verified by the accounts of many different families and taken as a basis of calculation by various writers, is in all probability not far wrong. If these data be granted, the amount of increased consumption is proved, and that portion of it which has not been imported must have been grown at home. But during the twenty-one years in question the ordinary wages of daily labour have risen at least 20 per cent., and barley-scones and oat-cakes have almost disappeared as articles of regular diet.

The construction of railways, docks, and other large public works has created a numerous class of navvies, plate-layers, and well paid officials, whilst the great extension of our staple industries has provided more constant and more profitable employment for our artizans and labourers than heretofore; so that both on account of our labourers having the means of supplying their families more liberally with food, and of wheat becoming more and more the staple diet of the million, we are convinced that a much larger addition is required to our present supply of wheat than would be necessary merely to feed the additional mouths according to the old standard rate per head. It follows then, as a matter of course, that the increase in the home-production of wheat between 1839 and 1859 was considerably in excess of the two million quarters, which we have endeavoured to prove to have been the *minimum*. It is satisfactory to feel that our large importations are not displacing home-grown corn, but that the skill of our farmers has been no less effective than the enterprise of our merchants in obtaining the large additional supply of food required by an increasing population.

The immense resources of our capitalists and our shipping have never been more strikingly exemplified than in the fact which this Table places prominently before us. The deficiency caused by a succession of three unusually bad harvests has been supplied from other countries to the extent of 4,410,546 quarters of wheat annually over and above what may be called the customary amount, viz. the average of the previous ten years, without any disturbance of the money market and almost without any one being aware of what was going on,—except the importers, who each year provided the requisite ten or twelve millions sterling and the farmers, who received that much less for their crops. Doubtless the loss has fallen heavily upon them, and had it not been for the help afforded by the remunerative prices of stock, wool, and dairy produce, many must have succumbed. To the decrees of Providence, however, all must bow, and had it not been for Free-trade, what would have been the result? Restricted supplies—high prices—a suffering and discontented population—and last, but not least, *the consciousness that their sufferings might have been prevented.*

Free Trade in Cattle.—Table (D.) shows the total importations of cattle, sheep, and swine, from July 9, 1842, the date of the removal of the prohibition, to December 31, 1862. It will be seen that so long as an import-duty of even 1*l.* per head was levied on cattle, and 3*s.* per head on sheep, the numbers imported were trifling; but that a considerable increase took place immediately after 1846, when the trade was made entirely free.

TABLE D.—CATTLE, SHEEP, and SWINE Imported into the United Kingdom.

Years.	Oxen and Bulls.	Cows.	Calves.	Sheep and Lambs.	Swine.
	Number.	Number.	Number.	Number.	Number.
*1842	3,156	1,038	70	644	410
1843	1,114	368	39	217	361
1844	3,682	1,154	53	2,817	265
1845	9,743	6,503	587	15,957	1,590
†1846	17,191	25,349	2,503	94,624	3,856
1847	27,831	35,480	12,406	142,720	1,242
1848	24,590	22,506	15,642	130,583	2,119
1849	21,884	17,920	13,645	129,266	2,653
1850	28,951	17,757	19,754	143,498	7,287
1851	37,624	24,026	24,870	201,859	15,599
1852	40,533	25,038	27,490	230,037	10,524
1853	56,220	38,328	30,705	259,420	12,757
1854	62,937	25,271	26,130	183,436	11,077
1855	63,687	10,063	23,777	162,642	12,171
1856	52,019	9,843	21,444	145,059	9,916
1857	53,277	12,371	27,315	177,207	10,678
1858	47,912	14,106	26,983	184,482	11,565
1859	55,960	7,334	22,383	250,580	11,084
1860	70,023	6,987	27,559	320,219	24,452
1861	71,288	9,906	25,902	312,923	30,308
1862	64,461	4,357	29,069	299,472	18,162

* July 9, 1842.—Prohibition to import Live Stock removed. Duty imposed on Cattle of 20*s.*; on Sheep of 3*s.*; and on Swine of 5*s.* per head.

† From March 19, 1846.—Free of Import Duty.

If the sixteen years succeeding 1846 be divided into four equ periods of four years each, as in Table (E.), it will be found th the trade in cows, which was considerable for a few years aft the ports were opened, soon declined, and has been pretty near abandoned; but that the number of prime animals (the bu forming a very inconsiderable portion of the numbers in the 1 column) has increased steadily, though not rapidly. The shee though with considerable fluctuations, have also increased.

TABLE E.—CATTLE, SHEEP, and SWINE Imported into the United Kingdom.

	Oxen and Bulls.	Cows.	Calves.	Sheep and Lambs.	Swi
	Number.	Number.	Number.	Number.	Num
Average of 4 years—					
1847 to 1850, inc.	25,814	23,415	15,361	136,516	3,[illegible]
1851 to 1854, inc.	49,328	28,165	27,298	218,688	12,4
1855 to 1858, inc.	54,223	11,595	24,879	167,347	11,0
1859 to 1862, inc.	65,433	7,146	26,228	295,798	21,0

We have unfortunately failed in our attempts to obtain an reliable statement of the number of live stock brought to mark in the principal cities and towns of the United Kingdom, so th we are unable to ascertain the proportion which the live stoc imported bears to the whole consumption of the country. Th it is but a small fraction of the entire supply is however evide by comparing the accompanying Tables (E.) and (F.),* fro which it appears that the average number of cattle imported i the four years 1859-1862, were barely 25 per cent., and the shee only 19 per cent. of the average numbers brought to market i those years in the metropolis alone.

Table (F.) embraces a period of thirty years, and dividin it into three equal periods of ten years each, Table (G.), we fin by comparing the 2nd decennial period with the 1st, that the has been an increase in the annual supply of *cattle* of 27 p cent.; and similarly comparing the 3rd period with the 2n that there has been a further increase of 22½ per cent. In th case of *sheep*, however, the increase in the 2nd period was only 11 per cent.; and in the 3rd period, there has been a falling-off 116,642 head annually, or 7 per cent. of the whole number of shee

* This Table has been kindly furnished by the authorities of the City of Londo For the continuation, subsequently to 1854, we are indebted to the officers of th Board of Trade.

ble F.—Cattle, Sheep, Calves and Pigs brought into Smithfield Market in each Year from 1833 to 1854; and into the Metropolitan Cattle Market, from 1855 to 1862.

		Beasts.	Sheep.	Calves.	Pigs.
		Number.	Number.	Number.	Number.
Brought into Smithfield Market.	1833	154,943	1,206,730	18,361	25,070
	1834	174,837	1,364,470	19,647	48,350
	1835	183,101	1,563,500	20,807	60,085
	1836	177,334	1,343,770	19,222	56,110
	1837	186,336	1,460,160	17,659	57,300
	1838	199,369	1,540,280	18,651	44,905
	1839	193,322	1,481,920	18,321	45,690
	1840	186,955	1,527,550	17,186	46,275
	1841	176,658	1,432,040	17,134	42,020
	1842	191,075	1,655,370	19,447	49,955
	1843	187,547	1,817,460	19,131	52,650
	1844	197,837	1,804,850	19,117	52,785
	1845	204,055	1,539,660	18,512	48,635
	1846	213,525	1,527,220	19,875	38,495
	1847	240,668	1,548,350	25,506	36,225
	1848	240,293	1,450,350	28,842	37,335
	1849	243,761	1,624,230	26,301	21,085
	1850	251,137	1,658,330	30,145	18,325
	1851	261,672	1,660,850	33,237	20,220
	1852	278,616	1,630,480	36,188	17,180
	1853	292,329	1,530,550	36,316	13,530
	1854	282,828	1,616,560	30,808	15,205
Brought into the Metropolitan Cattle Market.	1855	272,916	1,552,920	27,370	37,705
	1856	268,996	1,422,250	24,713	28,325
	1857	272,843	1,391,960	29,706	25,030
	1858	289,504	1,463,235	26,260	31,465
	1859	274,489	1,552,440	24,020	29,310
	1860	295,018	1,570,090	27,309	26,840
	1861	280,380	1,496,860	26,399	30,730
	1862	304,741	1,498,500	27,951	29,470

brought to market! This diminution in the supply has occurred, too, when, in consequence of the high prices of both wool and mutton, there has been a strong inducement to flockmasters to increase their production to the utmost extent. The deficiency may to some extent be accounted for by the largely increased quantity of meat sent to Newgate and Leadenhall markets. The supplies sent to these markets consist partly of meat killed in the metropolis, the live stock having been purchased in the Metropolitan Cattle Market: this has already been taken into account. The remainder consists chiefly of meat conveyed by railway.

TABLE G.—CATTLE and SHEEP brought into Smithfield and the Metropolitan Cattle Market.

	Average of the 10 Years, 1833-1842.	Average of the 10 Years, 1843-1852.	Increase (Numbers).	Increase Per Cent.	Average of the 10 Years, 1853-1862.	Increase (Numbers).	I Pe
le	182,393	231,911	49,518	27	284,304	52,393	
p	1,457,579	1,626,178	168,599	11½	1,509,536	Decrease. 116,642	D P

Comparing a return lately obtained from the principal Railway Companies which convey meat to the metropolis with a return furnished by the same Companies 10 years ago, it appears that the quantity of meat so carried has increased during the intervening period about 37 per cent. Supposing this to consist of beef and mutton in equal proportions, the additional 13,400 tons carried would give 6,700 tons of mutton, representing—if 80 lbs. be the average dead weight of a sheep—a goodly flock of 187,600 head.* If mutton form the larger portion of the consignments, as appears probable (say as 5 to 3), the number of sheep conveyed by rail to the metropolis as dead meat now would be 234,500 more than were similarly carried ten years ago. The falling off in the number shown at Smithfield during the same period was 116,642, leaving a balance of increase of 117,858. This increase in the number of live and dead sheep brought to market in the metropolis is not, however, derived from our own country; as it will be seen in Table (D.) that the average importations of sheep in the 4 years ending 1862 had increased by 119,658 over the average impor-

* No accounts are kept of the relative proportions of beef and mutton forwarded by railway.

tations in the 4 years ending 1852; so that, judging by the supplies sent to the metropolis (no bad test), it is pretty certain that *the number of British sheep sent to market has been for the last ten years stationary, if not retrograde.*

The supply of meat sent by railway consists, to a great extent, of prime joints, and consequently represents a greater number of head of live-stock than an equal weight of meat sent to market in the ordinary way (by the carcase). This consideration, however, cannot affect our calculation to any appreciable extent. Take the case of 100 sheep slaughtered at Norwich, where this trade is largely carried on. The fore-quarters of the whole 100 sheep are now consumed at Norwich, and the same consuming power would formerly have been supplied by 50 sheep slaughtered and wholly disposed of there. The other 50 would have been sent to London alive; whereas now the inhabitants of Norwich are willing to purchase the inferior joints at a lower price, and the consumers of the metropolis are also willing to pay for the privilege of having the hind-quarters of the whole 100 sheep *without* the inferior joints. It is, therefore, a mere transfer of the best parts of the animal to the best market, and does not of itself give any indication either of increase or decrease in the number slaughtered.

The slow rate of increase of our home-grown supplies of sheep becomes still more striking if we compare the number sent to the Metropolitan Market now with the number sold in Smithfield Market 40 years ago. In 1822 the number of cattle sold in Smithfield Market was 142,043, and of sheep 1,340,160. In 1862 the number of cattle brought into the Metropolitan Market was 304,741, and of sheep 1,498,500; so that whilst the cattle have increased *114 per cent.*, the sheep have increased not quite *12 per cent!*

Strong corroborative evidence of the increasing scarcity of sheep is afforded by the great rise which has occurred in the price of mutton within the last ten years. This has also to some extent affected the price of beef, notwithstanding good supplies of fat cattle.

The following comparative statement shows that between 1852 and 1862 the price of mutton has advanced 1*s.* 4*d.* per stone of 8 lbs., and that the stone of beef has advanced 10*d.* in the same time. This statement applies only to the "*prime*" or best quality of meat. Inferior mutton has in the same ten years only advanced 7*d.*, and inferior beef 5½*d.* per 8 lbs. It is common when comparing the prices of meat at different periods to take the average of different qualities. We prefer confining the comparison to the prime qualities, as the price of inferior meat is regulated much more by the proportion of inferior animals to

the whole number shown, and by the more or less injured sta from disease or travel, in which they come to market, than the general supplies of live-stock brought forward for consum tion. In other words, the price of inferior meat is depend not only on the quantity at market, but upon its degree of in riority; whereas prime meat is subject to but little variati in quality, and its price is therefore the safest measure of comparative plenty or scarcity of live-stock at different times.

Average Price of prime MUTTON and BEEF by the carcase in the Metropolitan Markets.*

	Average of 5 Years, ending 1853. (Per Stone of 8 lbs.)	Average of 5 Years, ending 1863. (Per Stone of 8 lbs.)	Increase in 10 Years.	Increase Per Cent
	s. d.	s. d.	s. d.	
Beef	4 2½	5 0½	0 10	20
Mutton	4 5	5 9	1 4	30

This great advance in the price of meat offers a strong indu ment to farmers to add to the numbers of their live-stock of kinds; but in the case of sheep, the long period during whi their rate of increase has failed to keep up with the increase consumption, makes the augmentation of our sheep-stock o of the most important farming questions of the day.

Having thus passed in review our supplies of corn and m for some years past, especially marking the effect of Free Tra upon both, we unavoidably arrive at the following conc sions:—

1st. That, except on those rare occasions when deficient h vests may occur simultaneously over a large proportion of t corn-growing regions of the world, the supplies of grain sent this country are likely to be so considerable as to keep prices a lower level than would be remunerating if corn-growing w considered (as it too often has been) a department of farmi which is complete in itself.

2nd. That the enormous quantity of foreign corn imported ate years has maintained in strength and comfort a much larg abouring population than could otherwise have been support in Great Britain, and has enabled our manufacturers and co nercial men largely to extend both their home and foreign tra

* The figures on which these calculations are founded are taken from Herbe aper. 'Journal' ... p. 456.

The wealth of this country has thus been so rapidly augmented as to create a consuming power which has increased the demand for meat more rapidly than either our own or foreign producers have been able to supply it.

3rd. That the breeding and feeding of live-stock have thus become such profitable operations that the growth of corn, *as a sequence to stock-farming*, has also become profitable even at present prices. Paradoxical, therefore, and unsound as it would have been thought twenty years ago, it is no less true, *that though Free Trade has discouraged bad farming in the shape of simple corn-growing, it has, on the other hand, given a powerful stimulus to good farming by making it possible still to grow corn with profit through the intervention of green-crops and live-stock.*

Tenure of Land.—The comparative advantages of leases and agreements terminable at short notice, have been much discussed of late, though little progress has hitherto been made towards a settlement of the question, or in making converts from one side to the other. The advocates of leases contend that under their system there are: 1st, Fewer instances of bad farming, which is *important to the public;* 2ndly, greater security for capital invested, which is *important to the tenant;* and, 3rdly, higher rent paid for the land, which is *important to the landlord.* On the other hand, it is argued, with reference to the first point, that there are numerous instances of properties, especially large properties, where the land is in quite as high a state of cultivation without leases as if held for a long fixed term, and consequently that when a property is badly farmed it is not the fault of the tenure, but of the agents or managers. There is considerable truth in this remark; but it is not entirely conclusive, as there are undoubtedly many poor and ignorant farmers who are allowed to hold on, as tenants at will, but to whom leases would never be granted, and who therefore on a general adoption of that system would have to make way for men of greater capital and energy. The second and third points cannot be denied. If, therefore, the case be argued on commercial principles alone, the advocates of leases have the best of the argument, and *doubtless in the long run this view of the matter will prevail;* but there are important social questions connected with it, which have hitherto prevented the general adoption of leases, and will continue to exercise a powerful retarding influence. Most landlords who let their land to tenants-at-will are aware that they could increase their rents by granting long leases; but before realising this additional income tenants must be changed, farms consolidated, and farm-buildings augmented and improved.

Of these obstacles the least are those connected with provic the requisite capital. Many landlords have funds at their posal which they would be happy to invest on such undeni security as their own land, especially to obtain such a lib return as a moderate increase of rent would supply, which, if the outlay were judiciously made, would be cheer paid. The owners of encumbered or settled estates have such facilities of obtaining advances either from Governmer private companies that some more influential reasons than want of funds must be found before the very slight prog made by the lease-system can be explained.

One of the most general of these causes is dislike on the of landowners to dispossess deserving tenants, many of w have held the same farms from father to son for generati and between whom and their landlord there exist personal which, if rudely severed, would be most inadequately repl by a few shillings an acre additional rent. Another equall fluential cause is the repugnance of the proprietors to give u much of the control over their estates as is implied by a l for any long term of years. They let their land below market value, for the sake of retaining the power of resur possession, at short notice, of any farm on which the te causes annoyance to his landlord, or sets a bad example to neighbours. The knowledge that such a power exists mak rarely necessary to exercise it.

It must not, however, be supposed that objections to lease only to be met with amongst landowners. Many tenants di the idea of being bound down for a term of years "for b for worse, for richer for poorer," and if coupled with a mod increase of rent, leases would, we are persuaded, be decline a majority of tenants at will. On a property in the nort England, entirely held under agreements terminable at six mo notice, the writer once offered nineteen-year leases, on the Sc principle, to the whole of the tenants. They took time for sideration, but eventually declined them to a man. On b asked their reasons, they said "they considered that under existing tenure the advantage was all on their side, for if farr prospered, they were sure they should not be disturbed, ar bad times should come, their hands would not be tied."

As these causes will probably long continue to operate, worth considering whether there are any practicable means once mitigating the evils arising from the very prevalent custo letting farms at will, or on agreements terminable at six mo notice. These evils, though apparently of very different kinds, is injury to the public by the inadequate cultivation of the l and injury to the tenant who, without sufficient cause, is sudd

dispossessed of his holding, are all referable to the same cause, viz., want of sufficient security for the capital of an improving tenant. The ingenuity of practical men has long been concentrated on this weak point in the present system, in the hope of devising such conditions as shall secure to an outgoing tenant repayment of the bulk of the capital laid out by him in recent improvements. An almost innumerable variety of covenants has thus been introduced into agreements in different parts of the country. Some of these are of a very complicated kind, and require from an entering tenant a large advance of money which is said to have been disbursed by the previous occupier, but which his successor has little power of verifying. Many a first-rate tenant has been deterred from taking farms hampered by agreements of this kind, as, instead of leaving him the master of his own capital, they oblige him to pay the cost of operations which, if honestly carried out, he would probably only partially approve, and if "scamped" would amount to a direct robbery. Doubtless the great majority of tenant-farmers would scorn to take advantage of the opportunity thus afforded for roguery, but out-going tenants are frequently needy men, and the temptation ought not to be thrown in their way. The principal object of these covenants is to reimburse to the outgoing tenant as large a portion of his outlay as is consistent with justice to his successor, which would probably be best attained by somewhat lengthening the requisite notice to quit. If 18 instead of 6 months were required in order to terminate a tenancy, the occupier would have the opportunity before he left of taking *one crop of corn from the whole of his arable land*, which would much simplify the conditions required for the protection of the outgoing tenant, and much diminish the amount to be paid by the incoming one. Where land is in high condition, the power of taking one crop of corn all round is of such obvious justice that it is unnecessary to support it by argument; and even where the land is poor and ill-farmed the tenure for one year longer would not enable the occupier unfairly to prejudice his successor, if his agreement restricted him (as all agreements should do) from taking two white crops in succession.*

When the principles of cultivation, manuring, and the nutrition of plants were much less understood, both by landlords and tenants, than they are at present, the greatest care and consideration were bestowed upon agreements, with a view to enforcing a particular course of cropping, and even in some cases of fixing the quantity and quality of lime, manure, &c., to be applied.

* This is quite compatible with special arrangements whereby safe tenants may be permitted to crop as they please, except when under notice to quit.

Any considerable deviation from the four-course system of husbandry was then believed to inflict such injury upon the land that letting a farm so treated would be like selling a lame horse, and would require a heavy sacrifice on the part of the owner. Now, however, no one disputes that "condition" can be restored to the land by a certain amount of exposure to the atmosphere and a certain amount of manuring, the materials for which can be purchased at most market-towns. In short, it is a mere question of a moderate amount of money applied with ordinary discretion, and not, as was formerly thought, the happy result of *much money* applied with *great skill* through an *indefinite period of years*, and which, when realized, ought to be guarded like the golden apples of famous memory.

The evident tendency of the present day is to make agreements extremely simple, to allow an in-coming tenant to be as little hampered as possible by the operations of his predecessor, but to devote the capital, whose possession ought to be a *sine quâ non*, to a thorough stocking and manuring of his farm, instead of battling about tillages and half tillages, and expending his capital on "*unexhausted improvements*," the existence of which is in many cases highly problematical. In order to combine freedom to the in-coming with justice to the outgoing tenant, the suggestion already made is thrown out with some confidence, viz., to give to all tenants-at-will an additional year's notice, and thus enable them to reimburse themselves instead of hampering their successors.

Improvements in Cultivation and Farm Management.—To a *bonâ fide* agriculturist the most interesting part of agricultural progress is that connected with cultivation and farm management; and the improvements to be noticed under this head are neither few nor unimportant. But though numerous and of various kinds, they chiefly spring from one source, which in itself is the most characteristic feature of the period in question, and may be described as the substitution of sound reasoning and arithmetical calculation for the empirical knowledge so much relied upon by our ancestors. That mixture of tradition and guess-work was certainly valuable in the absence of any sounder system, but was never to be relied upon when the circumstances under which it was acquired, whether of soil, season, or situation, were materially altered. In the first book of Euclid there is a proposition near the commencement which is familiarly known as the "Asses' Bridge;" and undoubtedly any student who makes himself thoroughly acquainted with that theorem has made an important step towards mastering the Elements of Geometry. In the past twenty-five years agriculturists have similarly bridged

over and successfully passed the great gulf which separates the *rule of thumb* from the *rule of three.* The man who paved the way for their advance, and manfully led the van through year after year of costly, intricate, and ill-appreciated labour, was Mr. Lawes, of Rothamsted. He it was who taught us that the soil has a natural standard of fertility, which enables it without the aid of manure to produce year after year a certain number of bushels of wheat or other grain. On his own farm at Rothampsted, though the land is by no means of first-rate quality, this average is about 16 bushels of wheat per acre, and has not diminished, though twenty-four crops of corn have been taken successively, of which the last twenty have been wheat. This has been done not only without the application of any kind of manure, but also without the intervention of any fallow or fallow crop.

It must be borne in mind that this average produce varies, within certain limits, according to the character of the season, and that it may be reduced by bad management, such as improper seeding or foulness of the land. But, with fair play, *all land has a certain standard of natural produce.* Such is the important proposition which Mr. Lawes has worked out under the eyes of the nation, and which must in future form the basis of all rational farming. In order to appreciate the full importance of this discovery it is only necessary to look at the new light thus thrown on the nature and capabilities of the soil. Twenty years ago, what could be more unintelligible than the terms used to describe the comparative fertility of different farms? Such a one was said to be in "*high condition*;" such another was "*out of condition.*" Who could define "*condition*"? It was considered a kind of mystery, of the real nature of which the experienced practical man was favoured with occasional glimpses, but which it was hopeless to attempt to explain to the uninitiated.

Now that we know that land has a natural store of the materials required for the production of grain, which confers upon it a certain moderate standard of fertility, we have the key to the solution of this mystery. Land that is thoroughly run out means land that is reduced to its original standard of productiveness. Any "condition" that it possesses in addition to this, be it more, or be it less, consists simply of the *remains of previous crops and previous manurings.* We are designedly leaving out of consideration all questions of tidy or slovenly management, such as those connected with draining, fencing, weeding, &c. If wet land be undrained, its standard of fertility will clearly be lower than if drained: if drained land be neglected, and the outfalls allowed to choke up, it will revert more and more towards the naturally lower standard of the undrained land; if land be divided into small fields, and high overgrown fences or hedgerow-trees be

allowed to overshadow the crop, or the corn be smothered w weeds, even the small natural produce may not be reaped fr the land. But all these faults are visible on the surface, a with respect to the unseen capabilities of the soil itself we n know, that nothing short of the most wilful and long-continu cropping without any return whatever—something worse ev than Mr. Lawes's twenty-four successive crops without manu or fallow—can materially injure the staple of the soil. It f lows that, after any ordinary amount of bad farming, suffici manure of the right kind will quickly restore to the soil, n its natural productiveness, which it is scarcely possible to destr but that acquired fertility which we may now describe as "*g condition*," without fear of being misunderstood.

But this is far from being all that we have learnt at Rotha sted. When a farm has been reduced by bad management to low state of productiveness, what is the right manure to appl In 1864 the merest tyro in farming can answer this questi *Nitrogen for corn—phosphorus for turnips*—are household wor Twenty years ago what would have been the stereotyped answe "The midden is the mither of the meal-kist." This is a max of much practical sagacity; but unfortunately for the owner a occupier of an impoverished farm in old days, the midden cou not be extended *ad libitum* when it was wanted over the wh farm at once; and accordingly years were expended and patier sorely tried before the traces of hard cropping and scanty m nuring could be effaced.

The great benefits conferred upon agriculture by Mr. Law have been stated in strong terms. It must not, therefore, be su posed that there is any wish to ignore or depreciate the labo and discoveries of Boussingault, Liebig, and other eminent m of science. Their analytical investigations, by showing us what materials our crops were composed, formed a sound ba and an indispensable starting-point for Lawes's experiments. an agricultural article it is not necessary to do more than offe cordial tribute of acknowledgment to men whose reputati in the annals of science is world-wide.

The great difference in value to agriculturists between t labours of Lawes and those of the scientific men who h preceded him may be illustrated by the familiar toy kno as the "Chinese puzzle." The puzzle had been taken pieces by previous investigators. Lawes set to work to put together again. They said (for instance) *wheat* is compos of certain chemical substances, in stated proportions. Law tried if, by restoring these materials to the soil, he could g back the wheat, or (which amounted to the same thing) get additional quantity of wheat from the land; and he followed

this first idea by the no less important inquiry: If these materials will not do, *what will?*

It would far exceed the limits of this article to attempt any description of Lawes's extensive series of experiments. It would also be a work of supererogation, as they have been described by himself and Dr. Gilbert in this Journal, from time to time. But whilst endeavouring to describe the agricultural progress realised during the last twenty-five years we wish to record our deliberate conviction that there has not during that time been any addition made to our knowledge which approaches in importance to the *insight obtained into the true principles of cropping and manuring* on the experimental farm at Rothamsted.

It will probably not be considered unpardonable egotism in the writer to place next in importance to the Rothamsted results the discovery which he first had the pleasure of announcing to agriculturists, viz., *the absorbent power of soils*, or the power possessed by the soil of decomposing and retaining for the sustenance of plants the ammoniacal and other salts which form the most valuable constituents of manure.* This principle, which was further investigated and much extended by Professor Way, formed the subject of several valuable papers in the Journal, from his pen.†

The true principles of *land drainage* have been keenly discussed during the period under consideration, and have to a great extent been settled by common consent, the exceptions being chiefly due to peculiar geological combinations or irregularities confined to particular localities. Our increased knowledge of the art of draining will be best appreciated by again referring to Mr. Pusey's Address of March, 1839. Speaking of Smith of Deanston's system, he says, " it is impossible to pass it over, although, of course, its introduction is too new to be placed already altogether beyond the reach of disappointment. Mr. Smith's mode of dealing with a clayey subsoil which holds up in the soil the water that has fallen in rain, and thus exerts some unexplained evil influence on plants fitted for the food of man or of cattle, is as follows." . . . After describing the plough and its mode of action, he continues: " The share of the subsoil-plough following, passes through and splits the whole of the subsoil to the depth of 18 or 20 inches, and the rain-water sinks, of course, so much lower. Mr. Smith, however, does not allow the rain to lodge here; he has previously dug covered drains about 3 feet deep, made thus deep in order that his underground plough may have room to pass over the covered channel." . . . It thus ap-

* 'Journal,' vol. xi. p. 68.
† Ibid. vol. xi. p. 313; vol. xiii. p. 123; vol. xv. p. 491.

pears that twenty-five years ago the best-informed man of his day o agricultural topics considered that furrow draining was "too ne to be *altogether beyond the risk of disappointment*;" that the mi chief caused to vegetation by stagnant water was "*unexplained*; and that, in his opinion, Smith of Deanston's only motive f making his drains 3 feet deep was to *put them out of the way of h subsoil-plough.*

The great addition made to the resources of the agricultur by the extensive supplies of what are termed *artificial manur* cannot be left unnoticed, though the annual importation of son hundreds of thousands of tons of guano, nitrate of soda, &c. &c has become of late years so much a matter of course that it difficult to realise the fact, that twenty years ago this trade ha barely commenced. During the Liverpool Meeting of the Roy Agricultural Society, in 1841, the writer, in company with th late Mr. Pusey, visited the well-known establishment of th Messrs. Skirving, where a sample of the first cargo of Peruvia guano was shown them as a great novelty.* At that time th supply of artificial manures consisted of very moderate import tions of bones and rapecake; and, with these exceptions, th British farmer's command of fertilizers was confined to th sweepings of his chimneys and the contents of his own farmyar This seems almost as incredible at the present day as wou have been the announcement, in 1839, that a score of years wou not pass before a numerous fleet of vessels would be permanent engaged in the artificial-manure trade, and when the mounta ranges of Europe, the plains of America, and the islands of th tropical seas would all be ransacked for materials to enrich o turnip-fields, and thus enable us to increase our flocks and o herds. Yet those who looked somewhat incredulously on th brown, effete-looking substance then known by the Spanish nan of "*huano*," have lived to see it become one of the princip means by which British agriculture has succeeded in produci the quantity of savoury chops and much-loved roast-beef requir to satisfy the cravings of John Bull and his numerous family.

The proper *management of manure*, whether liquid or soli has since 1839, been removed from the region of guesswor and is now regulated by simple maxims founded on the asce tained processes of chemical decomposition. The mode in whi the foregoing and other fundamental principles recently inco porated in the agricultural code act as guides to the practic farmer, will probably be placed before the reader in the most i telligible and connected form by describing in general terms t

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* The first *consignment* of guano to this country consisted of thirty bags, s July, 1839, to Messrs. Myers and Co. of Liverpool.

management of an imaginary farm, taken in hand by an advanced and improving agriculturist in 186–. We will suppose it to be thoroughly unimproved and out of condition; and as the clays present the most difficulties, we will commence with a clay farm *wet, foul,* and *poor.*

It may be well to premise that the entire description of this imaginary farm is derived from the writer's own observation and farming experience, though of course not all collected at one time or in one place.

The first object is to make the land dry; and our entering tenant is informed that "this farm cannot be drained; that all methods have been tried, but that it is as wet as ever; and that it's of no use wasting any more money upon it." He examines the drained fields, which are of three kinds. One is on a hill-side, and the drains are carried across the slope. He finds that in consequence of the deadness of the fall in the drains, and the sharpness of the slope of the land itself, the water not only makes its way *into* the drains but *out* of them again, and that the adjoining land is, as represented, wet as ever. He resolves to drain this land sufficiently up and down the hill to ensure the fall in the drain being more than a match for the fall of the land.

The second drained field is a strong loam, though in its present sodden state it has all the appearance and most of the attributes of the stiffest clay. Here the drains have been placed in the furrows, as the lands were high and beautifully rounded, and the previous tenant considered himself deeply in their debt for preserving a portion of his crop from the baleful influence of the stagnant water which remained all the winter in the intervening furrows. He therefore, in his care to preserve their form, rather added to than diminished their rotundity. On examination it is found that the reason why this land won't drain is solely its defective form. When land is flat each square foot of surface has only to dispose of the rain which falls upon it, but if laid in high-backed ridges, a large portion of the rain runs into the furrows, and carries with it the finer particles of soil and manure, thus effectually choking the natural pores and interstices of that portion of the land where the bulk of the water is accumulated. After a few heavy rains these furrows hold water like a dish, and the vegetation for some feet on each side of them is starved and stunted. On digging into this land it is found to have thin veins of sand which contain much water, and it is of importance to tap these Lilliputian springs as low as possible without incurring too much expense. Our *novus homo* consequently resolves to put in his drains 4 feet deep, and the mains 6 inches deeper. The curvilinear shape and

irregular width of the lands make it necessary to neglect th
altogether, and he lays out his drains 10 yards apart, havi
regard to the best obtainable fall, mentally resolving gradually
reduce the height of the lands until the whole can be brough
a level surface.

The third and last attempt at drainage that had been m
on the farm was in a field of pure unsophisticated clay. B
tenant and agent were convinced it would not answer, but s
meddlesome friend of the owner had insisted on digging a l
in the field, which, though covered with a flag on which a s
stantial coating of clay had been well trodden down, was u
countably found after a time to contain water; and it was
ficult to say why water shouldn't find its way into a drair
well as into a hole. So a few acres were to be tried, as the
would not be great, for everybody knew that it was of no us
drain clay deep, and inch pipes would be quite sufficient to c
off all the water there would be. In order, however, effectu
to stop the mouths of all objectors, a small portion was to be d
4 feet deep. The lands were 18 feet wide, so a few drains v
put in at a depth of 4 feet up every alternate furrow, and
remainder up each furrow at 2 feet deep. Both did good at f
but where the drains were in alternate furrows, and therefore
yards apart, the intermediate furrows held water all the wi
The shallow drains were the first to show symptoms of fail
and after a year or two deteriorated rapidly. In a few more y
even the deep drains became less efficient, and the triumph of
anti-drainers was complete.

But the farm was now in possession of a man who was n
satisfied until he could ascertain the cause of failure, and he
at a glance that the deep drains were too wide apart. The sl
ness with which water percolates through really strong cla
such that wide drains cannot in ordinary seasons remove the
plus water of one rainfall before another comes. He there
resolved to drain this land at six yards' interval, and as the co
deep drains at this width would be heavy, he determined to
his tiles 3 feet deep, considering a bed of dry soil of that d
sufficient for any of our ordinary crops. On examining
old drains to ascertain the cause of their deterioration and in
ciency, he found that though in general well laid, there
places where the ends of adjoining tiles were not exactly on
same level or in the same line of direction, either in consequ
of a little carelessness in the filling in, the occurrence of a l
stone which it would have been laborious to remove or v
round, or the removal of a smaller stone whose bed had not l
sufficiently solidly filled up. In these cases the narrow cha
afforded by inch pipes was sufficiently interrupted to check

flow of the water, and cause a deposit of silt, which eventually became cemented by a ferruginous deposit, and permanently reduced the effective width of the pipe. In the shallow drains these results were much aggravated by their nearness to the surface. A short drought was sufficient to open wide fissures down to the tiles, and the first heavy shower washed so much fine soil into the drains between the joints of the tiles that the run of water was unable to remove the deposit, and the action of the drains from that time became more and more feeble and ineffective.

There were two modes of avoiding these evils, viz., the use of collars or of larger pipes. He found that 2-inch pipes could be obtained at little more cost than inch pipes and collars, and after duly balancing their respective merits, the tendency of drainage-water on clay land to form a hard ochreous deposit, decided him in favour of the wider conduit, using collars only where a piece of boggy ground or running sand made it necessary to take additional precautions against silting-up. In such places it was found to be desirable to use long collars, making them overlap more or less, according to the urgency of the case.

Whilst planning his drainage operations, our farmer was not content to have his ideas bounded by what he saw on the surface, but followed with his mental vision the great ramification of roots upon which all plants depend for their stability and nourishment. He considered the description of materials collected in Nature's great laboratory, the decaying vegetation, the decomposing manure, and the various combinations of mineral elements. He knew that if a supply of water were long withheld, all the elaborate subterranean machinery would be brought to a stand; and on the other hand, that if water were always present, new and injurious combinations would take the place of the natural and healthy cookery for which the apparatus was designed. But when once the stagnant water was removed from below, then each successive shower would distribute to the greedy rootlets their ready-formed food, at the same time that it *prepared more* by bringing together the elements of nutrition which lay around, only waiting for this connecting link in order to work afresh at the task of elaborating the supply of materials for the growth of the leaves and stems above. Nor was this all—stagnant air is as bad as stagnant water, and the frequent descent of rain through the soil is required to displace from its pores the vitiated air, to be quickly renewed by a supply fresh from the atmosphere, which is as necessary for the healthy underground growth of vegetation as for the proper action of the lungs of animals. Arrangements were therefore made for the thorough drainage of the farm, on the principle that it was an object worthy of the utmost skill of the husbandman to secure as much

as possible the sinking of the rain into the land *as it fe where it fell.*

The next step was to form some plan for stockin cropping the land. Previous experience as an occup strong land enabled the tenant to lay down certain maxi axioms which he proposed to take as his guides. He ha vinced himself, 1st, that corn-growing alone would not present prices. 2nd. That the breeding and fattening of had for many years been more profitable than any other of farming; and that although this was clearly not a sheep still, with proper arrangements, it might be made to c moderate number of sheep with advantage both to the of the occupier and the condition of the land. 3rd. That keep is the item which it is most difficult to *keep down* o farms, and which, if not resolutely dealt with, will effe *keep down* the farmer's profits.

The plan now adopted was to buy in a sufficient num ewes in the autumn to run on the old grass land throu winter, at the rate of about one to the acre. In ordinary se they maintained themselves without extra keep until Chri from which time they received a small feed of oats dail lambing time. After lambing, turnips or mangold, prev stored on the grass, were given them, with corn or cake the winter tares or clover were ready to commence. By th these were consumed rape was ready, and by selling off the fat from time to time, and continuing the allowance of c cake to the ewes, all the lambs and most of the ewes we fat to the butcher by the time the rape was done and th had to be ploughed for wheat. This plan had the adv not only of realizing in a short time a handsome profit fr sheep, but of leaving the clover, tare, and rape land in fir condition for a crop of wheat. It also promoted the great of spreading the horse-labour more uniformly over the y the land was broken up as the green crop was consumed, a press of work avoided which usually occurs at the time of sowing. It thus became practicable to employ the whole immediately after harvest in preparing the land for swed mangold-wurzel, the acreage under root-crop being reduce ninimum by the growth of green crops for summer consum The following was the method followed:—As soon as the co out of the field, the stubble was scarified or breast-ploug lightly as to make sure of being able to burn in small heaps a was pared off. After spreading the ashes, 12 loads per a manure fresh from the yards were distributed evenly over th ...e, and ploughed in with a good deep furrow, of such a wi ...nd nearly ... on edge. Thus it remained fully e

to the weather during the whole winter; and as soon as dry weather set in in spring, a turn or two of the harrows, followed by a light grubber, destroyed the annual weeds, and the land was ready for sowing. Four cwt. of guano per acre sown broadcast and harrowed in with the seed, which was drilled on the flat at three feet between the rows, completed the operation. The tilth thus produced was superior to that obtained in any other way on strong clay; and though the land had only been winter-fallowed, any want of mellowness was made good during the early summer by frequent and thorough horse-hoeing, first shallow and then deeper, as more and more mould was formed. The advantages obtained by this system of growing roots were numerous:—1st. By securing an early seed-time, so that the crop was sufficiently mature to be removed from the land in October for storage at the homestead or on the grass for ewes and lambs in the spring. 2nd. By carting the manure on the land early in autumn, before the solidity produced by the drought of summer had been lost. 3rd. By the great economy of horse-labour in growing a fallow crop with only one ploughing, leaving the rest of the rough work to be done by the powerful though wayward team, *frost, snow, wind, and rain.*

Good crops of both swedes and mangold wurzel were grown in this way, at moderate cost; the only difference in cultivation being that the swedes were sown a month later, and that instead of 4 cwt. of guano per acre 2 cwt. of guano and 2 cwt. of superphosphate were sown broadcast at the time of sowing. But the heavy expense of carting a whole root-crop from the land prevented the tenant from growing any considerable acreage of either; his great object being to introduce as much as possible into the management of clay-land that characteristic feature of light-land farming which constitutes the great difference between them in point of profit, viz., *manuring the land by sheep instead of the dungcart.*

The management of the corn on this farm soon became the topic of conversation. From an average yield of two to three quarters per acre the wheat-crop soon rose to four and even five, and the spring-corn improved in proportion. Yet, when asked what he did to his corn, the farmer said, "*Nothing! but hoe it;*" and when pressed on the subject of manure his invariable answer was, "*If you take care of your land, the corn will take care of itself.*" These seemed but simple answers, but they meant much. The consumption of green crops on the land in summer has already been described; the improvements he introduced into the making and keeping of his manure have yet to be told. The two together evinced that care for his land, of which he spoke so oracularly, and which produced him such a bountiful return at the time of harvest. But

he set great store by his hoeing. In a dry spring, when wheat carried a splendid colour on good land, it used to turn yellow and sickly on this strong clay, even where well drained; and ou farmer said it was all from want of hoeing. He explained i thus: if land is in good condition, and free from stagnant water the roots of the wheat-plant will grow all through winter, and will extend over a considerable surface by the time when dry weather usually sets in. As soon as clay begins to dry it begins to crack, and the fissures are wide enough entirely to break of the small roots and sever the plant from a large portion of its supply of food. Hence its change of colour and loss of vigou during the dry weather, which is on all other grounds favourabl to its healthy development. This can only be prevented by horse-hoeing, not a single shallow hoeing, or rather sliding ove the surface, which only shaves off a few annual weeds, but hoe-ings repeated until a good covering of mould can be obtained When he had accomplished this, he used to boast that his cla would carry the wheat up to harvest better than any light land i the country.

The arrangements for stocking and managing the grass-lan on this farm were worthy of attention. It contained a good dea of inferior pasture, but no grass good enough to fatten a bullock and the previous plan had been to buy in young cattle in th spring, when most other graziers were doing the same, and whe consequently in nine years out of ten they were bought dear They had to be sold out again in the autumn, when many othe farmers were selling too; so that the tenant generally returne from the fair grumbling that he had scarcely got more tha he gave for his stock, and that his summer's grass was all bu thrown away. The difficulty on this land was that cattle could no be fattened at grass; and, if made up in winter, they either re quired more turnips than it was profitable to grow on such farm, or, if fed solely on corn and cake, it was difficult to mak them pay their way. The new tenant's first attempt was to giv his bullocks cake at grass, but some of them would not eat it and even with this assistance the grass was not good enough fo the purpose, and the cost was considerable. He therefore trie another plan, which turned out a complete success. He bough yearling heifers in May, and a young bull to run with them a grass. The bull was taken from them in August, so that non should calve later than May. The heifers remained in thes pastures until severe weather set in, when they were taken int the strawyard, and received once a day a feed of roots, if ther were any to spare; if not, 2 lbs. of linseed-cake daily, which, a 12*l.* per ton, cost 1*s.* 6*d.* per week. If in-calf heifers were ver dear in the spring, he occasionally sold a few just before calving

for as much money as if they were prime fat; but his usual course was to let the calves run with their dams all the summer. When taken up in October they were so fat and their points so well developed that they looked like prize beasts in miniature; and by keeping them well through the winter and spring they were eagerly bought by the butchers in June, when the winter-fed cattle had been nearly all slaughtered and the grass-fed had not yet come in. The heifers were disposed of as follows: a few that promised to be first-rate milkers were taken into the dairy; the greater part were sold for winter-feeding, and from their age and growth were worth about 2*l.* more than when bought in a year and a half before. The value of two summers' grass for a young heifer on pasture of this quality was rated at 4*l.*; linseed-cake for twenty weeks, at 1*s.* 6*d.* = 1*l.* 10*s*; so that the heifer when sold had cost about 5*l.* 10*s.*, from which, if her increased value be deducted, 3*l.* 10*s.* would be left as the cost of the calf. These calves received as much cake as they would eat, which did not exceed 1 lb. per day at first, and 3 lbs. at the latter end of the time, averaging 2 lbs. per day, at a cost of 1*s.* 6*d.* per week, or for the thirty-four weeks 2*l.* 11*s.* per head. Taking an average consumption of 2 stone of roots per day, for thirty-four weeks, each calf would consume 3 tons of roots, which, at 7*s.* per ton = 1*l.* 1*s.* These items, added to the keep of the heifer, made a total cost of 7*l.* 2*s.* each. The straw and attendance were considered to be well paid for by the manure.

The price at which these yearlings sold varied of course with the markets; but in consequence of their first-rate quality, and their light weights, which exactly suited the butchers during the hot weather, they were always worth 1*s.* per stone more than the average price of fat beef; and they generally fetched 1*l.* per month of their age, varying from 12*l.* to 16*l.* per head: one year the whole lot averaged 16*l.* each, their age being fourteen months. In all cases they left a handsome profit. The peculiar advantages of this system were thus described by the tenant. He said that when he took his half-fat cattle to market, he had to run after his customers; now they ran after him. Besides, it suited him better to feed cattle that ate 2 lbs. of cake per day than those that ate six: he always fancied that the big beasts ate *not only their share of the cake, but his too.* As to the meadow-land, the present occupier made a point of mowing as small a number of acres as possible; but in order to keep the acreage *down*, he said it was necessary to keep the condition *up*; and as the field of clover which had formerly been mown for winter fodder for the horses was now given up to the sheep, it was necessary either to mow more of the grass, or to put up with a smaller stack of hay, unless the land could be made to produce more per acre. This

the tenant did not think a very difficult task, when he was that the usual yield from 20 acres of meadow was about 15 of hay. He saw that the land required liberal treatment for years; and he therefore dressed it the first season with 2 of guano and 1 cwt. of nitrate of soda per acre, following the next year by a heavy dressing of well-made manure. also took care that the land should be cleared by the 1 March, as he had often seen a crop of hay ruined from the me being eaten bare in April. If drought sets in in May, la treated becomes parched for want of its natural covering, an grass receives so severe a check that it recovers very slo and if the season continues dry, the ultimate result is half a of hay, stacked some weeks later than usual, and no after- After two years of the treatment above mentioned, the cl and finer grasses sprang up so as completely to change the racter of the herbage in these meadows. They also prod half a ton more hay per acre.

The last point to be noticed in the management of this is the treatment of the manure. In consideration of the sp exertions of the new tenant, his landlord consented to roo a small fold-yard as an experiment; and the manure thus was tested against an equal quantity made in the ordinary The result was so decidedly in favour of the former, that some years' experience the tenant declared that he would pay for covering the yard himself than be deprived of the b derived from it. The cost of the roof was about 5*s.* per supe yard of the space covered; and the increased value of the m was found to be from 25 to 30 per cent. The advantage, how did not end there, as there was considerable saving of ex by not carting the manure into heaps, or turning it once or in the heap, as had been the previous custom. It remain the yard undisturbed until wanted, and was then in fir order for carting on to the land, whether applied to the gr for a fallow crop.

The time of publication has arrived, and the writer g regrets that he is unable to complete his programme. The subjects of great interest, intimately connected with agricu progress, which have been wholly untouched. Amongst may be named—the *latest improvements in the managem light land,* especially by *claying or marling—farm-build labourers' cottages,* and the *connection of railways with ag tural development.* To all these subjects he has devoted a deal of attention, and on each of them he was desirous of w a few pages in this Journal. The great difficulty, howe collecting any authentic statistics relating to agricultur caused months to be spent where apparently weeks should

sufficed; and all that is now possible is to "report progress," and ask leave to write again in order to complete the plan originally chalked out. He would fain hope, however, that sufficient has been done to show that the improvements introduced into farming practice within the last twenty-five years are greater than in any similar period on record. It is true that direct proof is rarely to be had; there are no data in existence which make it possible to state the ultimate result of these improvements in bushels of corn or tons of meat; but the chain of circumstantial evidence is so complete that no reasonable doubt can be entertained of the fact that, since 1839, a very large addition has been made to the food of both man and beast in these islands.

The most striking feature, however, of the period on which we have been engaged, which both gives a satisfactory aspect to the past, and warrants the most cheering anticipations for the future, is the improvement which has been effected in the position of the agriculturist, whether measured by the extent of his material resources or by the soundness and variety of the knowledge at his command. What was his position at the commencement of the period? It is scarcely an exaggeration to say that the thorough-bred British farmer of that day despised science as much as he feared Free-trade, and that the only things which commanded his entire confidence were his father's experience and his own skill. Mr. Pusey was undoubtedly far in advance of his generation when he adopted the motto, "Practice with Science," and even he considered it rather as an expression of what was *desirable* than of what was *probable*. The first attempts of the farmer and the philosopher to run in couples were certainly not encouraging. They conversed with one another in unknown tongues, and many of the early specimens of scientific practice, such as irrigation with the drainage from farmyards, artificial silicates to stiffen straw, &c. &c., were decided failures.

The Schoolmaster, however, was abroad; and farmers' sons, in common with those of all other classes, received a better education. It was considered necessary to teach them, at any rate, the alphabet of science. Scientific men were also found, who were willing to devote their time to agricultural investigations, and they saw the necessity for making themselves acquainted with the rudiments of practice, so that the votaries of science and of practice began to understand each other better, and their mutual distrust gradually wore off.

The difficulties attendant on the introduction of Free-trade have also been happily surmounted. That great change in our fiscal policy caused such a sudden influx of the agricultural products of other countries that prices were ruinously depressed, until the natural, but more tardy, effects of the change were shown

in an unparalleled expansion of trade and consequent increase c wealth and of effective demand for farm-produce.

Hence the quarter century just ending has seen agricultur relieved of its greatest cause of uncertainty and alarm, and re stored to its natural and unassailable position. It leaves th agriculturist better educated, and therefore more willing to b taught and more able to learn. It leaves him in possession c resources whether of machinery, manures, or means of loco motion, far in advance of the wildest dreams of his forefather It can, therefore, close its career with a satisfactory account c its stewardship; seeing that it hands over agriculture to its suc cessor free from all restrictions, with a demand for its product which has never been equalled, with the gigantic power of stea entirely under its control, and with the growing intelligence c the agriculturist just awakening to the consciousness of th boundless region of scientific improvement which lies invitingl within reach.

Kirby Hall, 1863-4.

II.—*Hop Cultivation.* By John P. Smith.

A Worcester Prize Essay.

The hop thrives best in moderately warm climates, and this ma account for Kent and Sussex, two of the most southerly countie being selected for its cultivation, and producing a very lar proportion of the annual yield of the kingdom. Worcester ar Hereford stand next in importance, and yield about one-eleven of the yearly average growth. Farnham and its neighbourho stand next as to quantity. The district known as the Nor Clays, in Nottinghamshire, formerly grew a fair quantity of go hops, but of late years the plantations have been much reduce the same remark applies to the district around Stow Market Suffolk, and also to the county of Essex.

A south-eastern aspect affords, in my opinion, the be situation for a hop garden, and if it be well protected from t west winds that prevail during the autumn, so much the bett as great mischief is often done by wind. Due care must taken to adapt the planting to the peculiarities of the so The Golding hop will be found to succeed best on dry friab soil, with a gravelly or rocky subsoil, such as we find in t hilly districts of Middle and East Kent, whilst Mathon Whi and Grapes, prefer a stronger soil, approaching to clay; t former variety flourishes on the deep land in the vale of t Teme, and the latter in the Weald of Kent and Sussex, which

mostly strong clay soil. Another variety, Cooper's White, a good sort, but delicate, is best suited for good strong *loam*. There are besides several kinds of red hops that are not approved by the brewer, and, in my opinion, cannot too soon become extinct; they are mostly grown on the poor lands of Herefordshire. Many other kinds are grown in Kent and Sussex, viz., Golden Tips, Pheasants, Golden Grapes, White Bines, Grapes, Jones's, &c., and a sort introduced some few years since by Mr. Colegate, and known by his name. This is a hardy variety and heavy cropper, but subject to blight, and repudiated by the brewer as a rank bad hop, yielding a most unpleasant flavour to the beer. A young planter should avoid this variety if he wishes to obtain a good character for his growth.

We will now assume that a suitable field—one that has been thoroughly drained—has been selected, and the preference given to an old piece of turf; in that case I would recommend that the land be trenched two spits deep, the top spit being kept uppermost, with the turf downwards. When the digging is finished, the surface should be harrowed, and rolled down as fine and level as possible, ready for setting out. The planter must next determine on the arrangement of the rows, whether on the angle or the square, and the distance from plant to plant. The usual method in Worcestershire and Herefordshire is to lay out the rows 7 or 8 feet apart, and set the plants $2\frac{1}{2}$ to 3 feet distant in the rows. If your land be good, and likely to be highly farmed, an uniform distance of 7 *feet square* may be recommended; good cultivation will ensure a large quantity of bine, and a sufficient quantity of sun to bring the fruit to perfection, whilst at this distance you have more room to cultivate without injuring the bines.

If this plan is adopted, you must prepare 889 small sticks, a foot to 18 inches long, for every acre, that being the number of hills which an acre will take at 7 feet square. First square your field, and then commence in the centre, working right and left; you will thus be more likely to be correct than if you begin on one side.

Your field being truly set out, you may prepare for planting; if you plant bedded or yearling sets (which are far preferable to cuttings), a man should take a spade, and remove the soil from two sides of the stick, the opening being 2 inches wide at the top, and 4 to 5 inches at the bottom, which should be deep enough to let the roots lie straight. Two strong-bedded roots are sufficient for a hill, but if not strong, 3 may be better. Care should be taken to bring the head of each root as close to the stick as possible, some good fine soil should then be put to the roots, and made firm with

the foot. For a plantation of 20 acres, with suitable oasts cooling rooms to dry and cool the crop in one month, for a class growth, the following varieties are recommended:—5 acr Cooper's White, or 3 Coopers and 2 Jones's; 6 acres Mathon or 7 acres of Goldings, and 2 or 3 Grapes; but this distributi sorts must, in a measure, be governed by the quality of the l that variety being most largely planted which is best suite the soil. The crop ought to be secured in three weeks, or tainly not more than a month; and it is most important to an early sort, such as Cooper's White or Jones's, to comm with, then will follow your Mathons, then the Goldings, lastly, the Grapes, a hardy sort, which will hang well for the picking. Jones's are serviceable to use up old poles. writer has seen a ton an acre on 7-feet poles. If, as is m the case in Sussex, one variety only be planted, you must b to pick before your hops are ripe, or have a considerable pr tion brown before you can finish.

If the planter should determine on a piece of old tilla recommend him to plough 10 inches, and subsoil as deep can; the ploughing completed, he will proceed the same as had been a meadow, with this exception, that after the stick truly set, he should dig holes 2 feet in diameter, and 2 feet placing the top or best soil on one side, and the bottom so the other side of the hole obliquely, so that the heaps ma interfere with replacing the sticks when the holes are ref Good dung or rather a rich compost should be wheeled on, fork or shovelful mixed with the *best soil* after the hole has half filled with good soil from the surface; this being fini you must readjust your sticks, and when your soil has had to settle, you may proceed to plant in the manner before descr On no account bury your manure. Should the weather be fa able, and your roots get a start, they will require two po each hill 6 to 7 feet long, and if the season be good, a cr 2 or 3 cwt. an acre may be grown; if cuttings are plante lose a year.

Potatoes and mangold are frequently planted between the and an ox-cabbage between each hill; this will, by man condemned, but much depends on the condition of the lan the disposition of the planter to make compensation to the for what has been taken out by the green crops by a dressi manure, which must be applied in the winter and du Turnips may be planted if the land admits of their bein off; and this plan, if oil-cake or corn be given, will manur and at a cheap rate, greatly to the benefit of the hops.

February and March are the months best suited for thro [illegible] cutting the land being first ploughed or dug.]

plough is used, a slip from 12 to 15 inches wide is left. Your men will commence digging these slips, cleaning the hills, and cutting the roots: this finished, your poles must be spread, and your pile rows ploughed, dug, and cut the same as the rest.

In the course of a fortnight or three weeks the bines will begin to appear, when no time should be lost in pitching the poles, which should be set by line to ensure regularity: the poles for this season, if the roots are strong, may be from 10 to 12 feet. The next operation is tying, but the tyer should first go over and take out the rank hollow bines; these should, on no account, be put up the poles, since they have a tendency to grow to an extravagant quantity of bine, without bearing a proportionate quantity of fruit—the next and less vigorous bines will be found far more fruitful. Some planters put three bines up each pole: if four poles are put to a hill, which is the custom at 7 feet square, two bines will be found sufficient; if three poles, put two twos and a three. The writer has often seen a heavy produce from a single bine. The tyers are paid by the acre, and go over the hills three or four times until the poles are furnished, when all superfluous bines and weeds are pulled out. This completes the tying, except by ladder, which is paid for extra. The men now follow, dig round the hills, and put a shovelful of soil into each hill—this prevents new bines from springing up.

Different varieties require different sized poles. On no account overpole, as much injury has resulted from it; 14-feet poles are long enough for any variety except Goldings, and for them I would not, as a rule, exceed 15 feet. Jones's will do well with 8 feet; Grapes 10 to 12; Coopers 12, and Mathons 12 to 14 feet, according to cultivation and quality of land. When your hops are tied, no time should be lost in working them with the nidget or scuffle, followed by the harrow—this should be done both ways. All working should be finished by the 1st of July, certainly by the 10th; considerable mischief is often done by working too late, unless in years of blight. When you have vermin on your bines, do nothing to your land—leave them until the vermin disappears—then go in with all your strength, nidgett both ways, and do all you can to put fresh vigour into the plant. Some planters manure in the winter, and some both winter and summer; but this may be carried too far for quality, and produce mould. The plan adopted in summer is to wheel in good dung or compost, take the soil from round the hills, put in the manure, and dig it in; or spread the compost (which I prefer) round the hills on the surface and dig in. All that is necessary after is to use your nidget, and harrow both ways, taking care not to pull up the dung. This should complete the work, unless hoeing is required to keep down annuals.

Picking commences in early seasons from the 1st to the 8th September; in late ones, from the 15th to the 20th. Before it begins due provision should be made, and everything got in readiness: cokes may be sent for in July and August, and a sufficient number of pickers engaged to keep your kilns or oasts properly at work. In this you must be governed by the size o the hops. Different plans are adopted in picking and measuring some measure by tally, others by book and cards representing th number of each crib or bin. I have found it best to put two crib into the centre of 100 hills; this is called a "house," and th cribs remain until the work is finished. The poles will be i two heaps at either end of the cribs, and in the proper place fo stripping and piling. If this is strictly carried out, much troubl is saved in piling the poles. When a sufficient number of sack are picked to load one kiln (and this should be done befor breakfast), they should be taken and put on the oast, and so o until all your kilns or oasts are loaded; and it should be s managed that hops enough be picked to reload the kilns a night.

Hop-drying requires great attention, and the *slower*, in reason they are dried, the better. They should be dried by a current o hot air being continuously passed through them, and not b combustion. Many say they can dry hops in seven or eigh hours; rely on it, it is better to take twelve, and let your hea not exceed 112 to 115 degrees. When the hops are sufficientl dried, the fire should be raked or allowed to go down, the hop remaining on the kiln until they become soft, which will preven their breaking on being removed to the cooling-room. Thes hops will be fit to be bagged the next day, and with a prope staff this should be carried out through the picking.

Poles are a heavy item in the cost of hop-cultivation, an should be carefully husbanded. Their wearing value may b *doubled* by pickling 2½ feet at the sharpened end with creosote A tank for the purpose must be erected of size in proportion t the plantation. By the application of creosote, soft wood, suc as that of the willow, &c., becomes hardened, and equal to as or other more durable sorts.

The writer has a plantation of 75 acres, and a tank 12 fee long by 5 wide, and 3½ feet deep. This tank will hold 100 best poles put to stand up. The tank must be filled with creosot within 8 inches of the top when the poles are in, when wate fully 2 inches deep must be added to prevent evaporation. Th tank should boil slowly twenty-four hours, when the poles may b removed and the tank refilled. Care must be taken that th tank does not boil over, as creosote is most inflammable and ma take fire. I am so satisfied as to the value of creosoting pole

that I never intend to put a new pole into my ground without its aid. If poles were pickled one year under another, and stored in a stack till dry, they would be found to last far longer than if used in a green state.

The hop-plant has a variety of enemies: on the first appearance of the bine it is frequently attacked by *flea*, which checks its growth, and makes it look scrubby and unhealthy, but never destroys the crop. Wireworms are a great pest; the best plan to get rid of them is to cut a potato in half, and place it close on either side the root an inch below the surface; the potato lures the worm, and, if taken up every other morning for a fortnight, enables you to take a great quantity; I have known of a dozen being taken from one root. The greatest enemy is the *aphis*, and I regret to say that on the most important subject of its history we are as ignorant as our forefathers; we go to bed leaving our garden free, and next morning we find *aphis*—from one to ten or twenty—on a small leaf, which in the course of a week have increased to countless myriads. These pests are followed by nits and lice, which some seasons multiply so rapidly as to destroy the bine and the planter's prospects. I would here repeat the recommendation which I have already given to the planter, not to work his hops when in a state of blight. When closely watching the blights of 1860, '61, and '62, I have observed that in all cases where the land was best tilled, manured, and cared for, the blight remained until too late in the season for the chance of a crop; on the other hand, where nothing was done, but weeds were suffered to grow nearly half-way up the poles, the bine became yellow and clean, and the result was a fair sprinkling of hops; in such ground, the vermin had left the hop for want of sap and taken to the weeds.

Of late years a machine has been used to pack the hops, which is very useful when there is a large crop, as it enables you to pack your hops much sooner. Treading up is preferable, if care be taken to have the hops in a fit state not to break under the foot; if allowed to become *too* cool they are hard and lumpy in the sample, and are termed *cold*. A master's attention to the state of his hops before bagging is most necessary to good management. Hops are picked in Worcestershire and Herefordshire far more free from leaves than in Kent or Sussex. They should be sent, if possible, to the oast without a leaf, dried slowly, taken off the kiln in a *soft*, *not* a brittle state, and trod into the pocket as soon as sufficiently cool; they do not then break under the foot. In Kent and Sussex hops are dried in a variety of ways, and with several kinds of fuel. In oasts on the Cockle principle anything may be used, and a considerable quantity of sulphur is required; but on the open fire principle Welsh coal and coke is used, and a small quantity of sulphur.

The cokes we get from Abberley and Pensax, in Worcester shire, are highly charged with sulphur, which will account for s little being added in these counties. Its only value is to giv brilliancy to the sample, and, if used in excess, brewers object t it as affecting the fermentation of their worts.

It has been the practice in Worcestershire and Herefordshir to make eight sacks out of one piece of cloth of 36 yards, an the weight of the pockets when filled run from 1 cwt. 1 qr. t 1 cwt. 2 qrs. It is my practice to make seven sacks from piece, and I am thereby enabled to get 1 cwt. 2 qrs. to 1 cwt. 3 qr into a pocket, and I would respectfully recommend my brothe planters to do the same. A heavy pocket has many advantage over a light one; you pay less for weighing, porterage, an warehouse rent, and you get your hops more quickly into con sumption.

It was formerly the practice to roll, riddle, and otherwise brea and spoil good hops; this silly practice is in a great measu exploded. Plant the best sorts, such as Coopers, Mathons, an Goldings; pick them clean, dry them properly, and put the into the pockets as whole as possible. By breaking the hop yo lose a large quantity of the pollen, which contains *the most valuab brewing properties.*

The cost of hop cultivation per acre may be estimated a follows:—

	£.	s.	d.
Yearly charge for poles	5	0	0
Ploughing down	0	10	0
Digging slips (or portion not ploughed)	0	5	0
Cutting, picking up, and burying roots	0	4	0
Spreading poles	0	2	0
Pitching or setting poles	0	12	0
Tying	0	8	0
Nidgetting or scuffling 4 times	1	0	0
Harrowing 4 times	0	6	0
Forking round hills and hilling up	0	5	0
Stripping and piling poles	0	8	0
Resharpening broken poles	0	3	0
Ploughing up before winter	0	10	0
Manuring, if with dung, 20 loads per acre, at 8s.	8	0	0
If manured in summer	4	0	0
Ladder tying	0	2	0
	21	15	0
If you dig instead of plough, 15s. per acre extra	0	15	0
Total	22	10	0

Lower Wick, Worcester.

III.—*On Education as connected with Agriculture.* By the Rev. J. L. Brereton, Rector of West Buckland, Devon, and Prebendary of Exeter Cathedral.

The subject of education has not hitherto been very popular with farmers, and seldom forms a topic of discussion at their meetings or in their journals. This has arisen partly from their instinctive feeling that education is a matter of books and study, while farming is a matter of life and practice, and that these are contrary the one to the other; but partly also is it due to the fact that education is a social question, and that no class of men are so sensitive on such matters as those who belong neither to the higher nor the lower, but to the intermediate ranks of society. But though good reasons may be given for avoiding the discussion, there are reasons even more urgent and practical for entering upon it. On the one hand, farming is becoming, not indeed less a matter of practice, but more than ever a matter of study; and on the other, social questions are forced by the progress and pressure of society into a prominence which may be contrary to our tastes, but which neither duty nor interest can neglect. The time has come when the consideration of education as connected with agriculture will not be considered intrusive even in the special province of an agricultural journal.

And whereas agriculture more than any other pursuit distributes its followers into three distinct grades—the owners, the occupiers, the labourers, of the land—so does this distribution into a higher, middle, and lower class, form the most convenient basis for the treatment of the subject of education. By this threefold division it can best be mastered as an interesting matter of thought, and still more practically discussed as an important field for public action. This threefold division of those through whom agriculture, as a special pursuit, becomes connected with education, as a general principle, will be the connecting thought of the following pages. But because so much has been done for the education of the higher and of the lower classes, and so much avowedly remains to be done for those who come between, the inquiries and suggestions I shall venture to make will have a special reference to the farmers, as forming a large and most important section of the English middle class.

There are two questions which must have often occurred to those whose tastes or pursuits will have made them readers of an agricultural journal. One is, "What is the best education for a farmer?" The other, "What is the best education for a farmer's

son?" And though these questions are respectively suggested by different circumstances, yet they are sufficiently related to admit of discussion in the same paper.

Farmers are not necessarily or in fact all the sons of farmers, still less are all the sons of farmers intended to be farmers. "The best education for a farmer" presupposes nothing as to the class of life from which a pupil comes. "The best education for a farmer's son" assumes nothing as to his ultimate destination. In the former case, the end absolutely decides the means to be employed: in the latter the means may limit, but do not control the selection of ends.

It would, therefore, be quite possible to discuss either of these questions without reference to the other. And either would of itself deserve the attention of all who take an interest in agricultural life. But as the two subjects of general and special education, though distinct, have yet a mutual interdependence and can best be considered simultaneously, I will ask my readers to bear them both in mind.

In order to do so the more easily, let them bring to their minds the common case of a farmer with a large family, who desires one at least of his sons to follow his own pursuits, others to adopt some of the various openings of life to which education furnishes the approach. Only let it be remembered that as the English farmer represents one of the largest sections of our national society—in some places touching, by his share in actual labour, the operative class, in others joining and gladly welcomed among the honourable company of gentlemen—so the education of a farmer's son admits of a wide latitude of standard. If, however, we assume as an average English farmer, or at least as a specimen sufficiently illustrative for our purpose, one who occupies with sufficient capital from 300 to 500 acres, and who would wish his sons to earn incomes not under 100*l.* a year, we may I think roughly estimate the cost of the education that would suit such a parent's requirements.

We may consider the question of the relative advantages and faults of *public* and *private* education to have been sufficiently solved by the experience of the higher classes. Their verdict has unmistakeably been in favour of public education as the rule, allowing great exceptional value to private education in particular cases, and as preparatory or supplementary to the public schools. The broad difference between a public and private school is that the former is not, but the latter is the property of the master who conducts it. A purely public school is one the whole property of which is entrusted to disinterested guardians, with or without local and personal preference and limitations. But between this

and a private school, the property of its master, there are intermediate schools, partly public and partly private. They are the property neither of the masters who conduct them, nor of trustees, but of proprietors who have established them, either as commercial enterprises or for the benefit of certain localities, professions, or occupations. In these the public or the private character may preponderate. The views of the original proprietors, the restrictions they may by trust or otherwise impose upon the conduct of their institution, the realization of immediate or more remote advantages, will all go to determine whether they should be considered more as public or as private establishments.

This rough classification of schools into public, private, and intermediate, will be of service to us in determining whether existing schools supply the practical requirements for the farmer's family, or whether new schools should be established, and, if so, what should be their character.

We may suppose then that, as in the higher ranks, so among the middle classes, the preference will be given to public schools, the more education is valued and its permanent interests considered. But the best of the foundation schools of the country are already more than filled by the sons of the gentry. Nor has it hitherto appeared easy to adapt those that are not thus monopolised by the candidates for the Universities and higher professions to the practical requirements of modern English education. This is not indeed to be despaired of, and the 500 endowed grammar-schools of England may yet have a great future. But their reformation and revival will follow, I think, rather than precede the establishment of a thorough system of public English education, which, imitating that of which the English gentry are so proud, and which has made their own country proud and other countries emulous of them, shall yet embrace and satisfy the far more numerous class connected with the commerce, manufacture, and agriculture of our country. Of the means of establishing such a system I shall presently say more. Here I can only repeat the opinion that the renewal or revivification of stagnant grammar-schools has seemed hitherto a more difficult task than the establishment of new institutions primarily devised for the objects and circumstances of the present generation. And since we live in an age more impatient for immediate results than prepared, like our forefathers, to sow the seed of a long-distant harvest, I am inclined to think that we should look to a large development of those proprietary schools which I have described as intermediate between the purely public and strictly private schools. Only from the very outset it will be no injury to the immediate results, but a provision for permanent effects, if every

effort is made avowedly and honestly to give a public and honour-able rather than a merely private commercial character to suct schools. The readiest means of doing so is to attach them bj name, and, as possible, by constitution to some of the ancien fundamental institutions of the nation. Of these there are tw that offer themselves at once for consideration—the Church an the State. The former has always been identified with the edu cation of all classes: the latter has of late years assumed a large indeed a preponderating share in the maintenance and directio of the education of the labourer, while it has only touched, bu without affecting their general character, our old universities an public and grammar schools. But it needs not many sentence to show that though any public education in England must nc only have a religious character, but be so in harmony with th broad principles of the Church of England as to ensure the cordia cooperation of its clergy and laity; yet an exclusive Churc character would only shut out from its advantages a very larg number of the middle class. Or again it may be easily show that though Englishmen will expect their sons to be trained i the utmost loyalty to the Crown and obedience to constitute authority, yet the independent classes will expect their school like their homes to be free alike from State support and Govern ment inspection. There remains, I think, an alternative. Th ancient organization of the English *counties* is sufficiently con nected with all the best associations both of Church and Stat yet sufficiently free from exclusive and arbitrary influences t offer a common name and many local centres round which th public education of the middle classes may be safely and honour ably grouped.

Public proprietary schools, distributed through the variou counties of England, and associated as much as possible with a the honourable and influential names and personages of thes counties, are, I have long ventured to think, the first requisit towards improved agricultural education. Such schools wi supply, not only to the future farmer but to all the farmer's sor that general groundwork of education which should precede an be the foundation of all sound knowledge and special practic That such schools may be established at a moderate outlay c capital, and be conducted remuneratively at no very high charg to parents, is not only a reasonable assumption but an ascertaine fact. I append to this paper an analysis of the cost of establishin the Devon County School, as well as of its annual expenditur It will show that the cost of building a handsome school for 10 boarders, of furnishing it, of purchasing about ten acres of groun of conducting it from its commencement with two pupils, abo

five years ago, to its present development with some sixty boarders and fifteen day-boys, has been between 6000*l.* and 7000*l.*, and that a rate of payment averaging 23*l.* per boarder is found to cover the whole annual expenditure. In some counties the cost of building, the price of land, and the rate of wages may be so much higher as to raise the average cost of establishing such schools, and the average rate of payment necessary to make them self-supporting. But even higher sums would be very far from putting such schools out of the reach of the average English farmer.

What, then, would be the nature of the teaching and training the farmer's son should expect to find in these schools? and how far would they be suited equally to the son who is intended to be a farmer, and to his brothers who are to go into other trades and professions? These questions lead us to a farther step in our discussion. The character of the education given in a public school depends not only, as in a private school, on the acquirement and ability of the master at its head, but also on the general system of education according to which the master himself has been trained, and on the public competitive tests by which attainment is certified, and the merit both of the school and of individual pupils made known.

The education of the higher and lower ranks is regulated and maintained in each case by such a system. I will not do more than allude to the effect which, on the one hand, the Universities by their degrees and honours have upon the great public schools and subsidiary system of private tuition by which the majority of the English gentry are brought up; and, on the other, to the influence which the Government grant in aid of local contributions, as administered by the Privy Council, exercises upon the education of the lower class. This reference is not intended to imply any approval of the State grant, and still less to decide whether in principle or results, its action is worthy of comparison with the independent working of the University system, but simply as an illustration of the proposition, that both the teaching and discipline—that is, the education—of a public school must depend upon the system to which it belongs, and not only to the accidental merit of its master.

The comparative deficiencies of middle-class education may be attributed to the fact, that neither in the development during this century of the higher system, nor in the establishment of the lower, has there as yet been provision made for the large intermediate class who can neither aspire to the former nor condescend to the latter. There are indeed many advocates for so extending these two systems as to embrace all the upper middle class in the educational system of the gentry, and to absorb the

remainder in that formed by the help of the State for the labourer. It is also still an open question, though not likely long to be so, whether public opinion will acquiesce in the permanent establishment of those subsidiary examinations which the Universities have recently undertaken for the middle class, or whether it will adopt the proposal to establish, in connexion with the different counties, a new educational system with its own public schools, colleges, and university. In either case we may hope that a standard will be gradually fixed both for general knowledge and for special studies, which will remove the existing uncertainty of object and irregularity of method, which are equally injurious to the teacher and the taught, to the school and the home.

The effects which such a definite standard would have upon the English farmer's family can hardly be overrated. When once it becomes recognised as the rule, that all the sons of the family should complete their education by obtaining a degree, the habits of the household would be regulated accordingly; and the mere necessary arrangements for study would open in the seclusion and frequent leisure of the farmer's home prospects of domestic order and happiness hitherto almost unknown. Such an object alone, without reference to the means of its attainment, would insure this. For equally the holidays of the schoolboy, the vacation of the collegian, or the daily pursuits of the home-student would have this effect, which would also extend indirectly to the female members of the family. I have long considered that such a degree, whether conferred by the present Universities, or as resulting from the successful establishment of a new county system, was the first requisite for raising the tone of the middle classes.

Its primary object, however, would not be to affect them in their homes, but to fit them for leaving the parent hearth and entering upon the world. Those who had obtained it would have a passport to educated society; and whatever their special profession or occupation, would be entitled to the freer intercourse with members of other professions and pursuits, which is among the most valuable of the social and intellectual privileges that a man can possess. Such an acquisition would have the happy effect of making the future farmer more at his ease with both the gentry and the labourers; because a man who has attained an honourable status, which others recognise as well as himself, is set free from many embarrassments which await any one whose education is doubtful and position undefined.

Though I have no pretensions to write on purely agricultural subjects, I cannot forbear to point out the importance, merely with a view to agricultural progress, of increasing the farmer's

confidence in his own position, as meriting respect and consideration whether from his landlord, his labourer, or his neighbours. I do not say that an educational degree alone would give this advantage where it is not combined with personal character, with respectability of connexion, and with sufficient capital for the position the man holds. But how often are one or other of these qualifications, when exclusively relied on, mere sources of pride and offence, of vanity and vexation, because the man himself, his family, or his purse have to sustain a disproportionate strain owing to one fatal defect, "under-education."

But I must not think or write only of the social advantages of an educational degree. That degree should imply a thorough knowledge of the English and at least one other language, with a tolerably high standard of mathematical knowledge, besides history and geography. How many excellent men have now to regret the want of these attainments, not only as debarring them from much of the best social intercourse, but as actually hindering them in their business or profession! Any difficulty men find in expressing themselves, or readily ascertaining the meaning of others, whether in speaking or in reading and writing, is a serious impediment to business, in times when clear understanding and prompt despatch are of growing importance as the relations of men become more complicated, and the pressure of affairs more urgent. On the many occasions when time is money, slowness in calculation may be, in the short run, a cause of as much loss and hindrance as miscalculation is sure to be in the long run. And further, an ignorance of places and events may lead to a total inability in any practical sense to follow up the opportunities, or avoid the special risks of a man's own times, nation, or trade.

Beyond his social position and his business, there are other relations in which to have attained a distinct standard of education will conduce even more to a man's happiness and usefulness. But lest I should be thought out of place, I will only say that I allude to religion and politics,—two subjects on which all men must think, and many will both think and speak strongly, but on which the ill-informed are almost sure (to say no more) to perplex themselves and mislead others.

Education, however, does not consist only of information. It is not so much what a man *knows* as what he *is* that will determine his conduct and success in life. And this a mere examination can never ascertain. I do not speak only of raw, undigested knowledge; for even sound knowledge carefully learnt and stored,—such as it is the peculiar attribute of a *good* examination to distinguish from mere cram,—even this is unimportant compared with the character and habits of the man, and espe-

cially the practical knowledge of himself and others which, though it may and often is an accompaniment of scholarship, is not so by necessity. It is therefore desirable that the degree which certifies the attainments should in some measure also testify to the training of the man. This can only be done when it is connected with residence.

A University degree at Oxford and Cambridge now implies not only that a man has so much knowledge of classics, &c., but that he has spent some three years at college, and that either he himself, or at least a large number of his fellow-graduates, had previously to their college course, passed several years at a public school. And I think I may say with confidence, that the value of this training for life, which is thus implied, is even greater than the value of the knowledge certified by the standard of the degree. Why should not the same "training for life," through a school and college course, be opened to the sons of farmers and others? The period of such a course must necessarily be shorter than that which, on the average, prevails with the higher classes, and would end as much before as the other is protracted beyond the age of twenty. From seventeen to nineteen would probably be the period of taking the "county" or whatever be the general middle-class "degree." Farmers' sons at present often leave school as young as fifteen. With better schools and a definite object, their stay might and should be protracted to sixteen or seventeen, and still leave a year at least for a higher course of study, and a more manly training at college.* What will be the number of those who will or can afford this prolonged sacrifice to education can only be ascertained by gradual experiment; but a very small proportion of the present boarders in middle-class schools would suffice to maintain a college in most of the large counties, or certainly in groups of contiguous counties. And if recent or future changes in the administration of the Government aid to education should lead to a change in the class of masters for the National schools, substituting for those who are educated at the Government expense men who have been able to provide their own education, the present Training College would, as has been long ago suggested by Lord Fortescue, frequently become an excellent nucleus for a County College.

And this leads me to pass slightly from the education of th

* I may be permitted here to deprecate the unmeaning and mischievous confusion of the terms "school" and "college" which is beginning to prevail. A larger or more pretentious school is at once called a college, and the distinction between the elementary instruction and discipline of the boy, and the more advanced and liberal education of the young man is lost. College should be the continuation of school, implying a protracted expenditure of time, money, and effort on the part both of parent and student.

farmer to that of his landlord on the one hand, and his labourer on the other. It seems very desirable that, as he will have so much to do with these in his business and after-life, so at some point or other of his education he should come into contact with both, and establish some links of fellowship and sympathy not inconsistent with his relative position towards either. These points of contact might be formed in the elementary day-school at the outset, and in the college at the completion of his course. If the elementary schools of England were under masters and mistresses who, in addition to sufficiency of knowledge and efficiency of teaching, enjoyed the advantage of respectable parentage, and the consciousness of honourable independence in their position, I see no reason why the children of all the middle classes, and the farmers especially, should not receive in these schools their first rudiments.

The labourer's children, as a general rule, could not go beyond these schools, or stay in them after the age of twelve. In agriculture, as in manufactures, children's labour seems to become more valuable with every improvement in machinery; and there is a constantly increasing need for the protection of childhood from the excessive use by parents and masters of this source of profit. Still, however this state of things may require to be regulated, it is in itself a happy circumstance that employment offers a very early maintenance to the labourer's children; for industrious earnings are of more value to society than unearned education. The early age, therefore, at which the labourer's child should reasonably be expected, and indeed encouraged, to leave school for work will always determine the limits of the elementary or village school. These should be further defined by accurate certificates of competence in the rudimentary subjects of writing, reading, and ciphering. It would be well if employers made such certificates available, if not essential, as introductions to service; at all events they would serve the employer's children as a mark of proficiency on entering the higher boarding or day school, the expense of which would be beyond the means of the labourer.

I must repeat, though I fear the opinion will grate upon the feelings of some parents, that if the elementary schools were generally under the charge of respected and efficient teachers, no injury would be done to the child of the higher class by sitting for a while on the same bench, and learning the same lesson, with the child of his father's subordinate; and it might be that many a kindly and pleasant association would spring up in after-life from the recollection of this early intercourse.

Again, if with the county colleges in which the farmers' sons would, after passing through school, end their education, there

should be connected special scientific instruction, with superi professors and apparatus, it might be expected that in the higher academies he might meet the son of the landlord, wh having passed through the public school, and perhaps complet his general education at the University, would seek in his ow neighbourhood the advantages thus offered him as a preparati for his proper share in the practical business of life.

But beyond these points of contact the very best union b tween different grades would be promoted by the fresh oppo tunities which an intermediate public system, aided by endo ments, would afford, both for the best sons of the laboure through merit and industry, to enter the higher schools of th employers, and also for many of the farmers' sons by the sar means to pass on beyond the county schools and colleges in the higher universities.

The views which I have thus rather intimated than urg respecting education in connection with agriculture are r recently formed, and have been applied to the test of some pra tical experiment. I have found that a proprietary public sch has been welcomed as a boon by the farmers of the part England in which I live. I have found that the expense establishing such a school has not been disproportionate to t resources of the district which it benefits, and that a self-su porting system of public education which had been looked upon a hopeless problem begins to be no longer so regarded. It l been found necessary, in order to maintain the efficiency of t teaching in the Devon County School to connect it closely w the Middle Class Examinations established by the Universiti Indeed, this has been the first school in England that l become of itself a local centre for the Cambridge Examinatio and already in two consecutive years it has required the wh of its first and second classes to pass through that useful, beca strict, ordeal. But these University examinations were anti pated, if not suggested, by the proposal for a County degr And though I have had few opportunities of conferring with promoters of the University scheme, yet observation and refl tion have made me think that these schemes will not pern nently supply the wants of the middle classes, while they n impair the position which Oxford and Cambridge now hold completing the education of the higher classes. Either Cambridge plan of giving a certificate only, or that of Oxf which confers the titular degree of A.A., must, one would thi be adopted eventually by both. But the certificate without title will be deficient in honour compared with other degr and the new title itself, if maintained, will stand in invidi relation to the older titles of resident graduates. This

appointment or this rivalry would not attach to an independent degree conferred by a special "Royal County University," as proposed by Lord Fortescue in his pamphlet just published,* with its own affiliated colleges and schools through the various counties of England. The constitution of that University might in form and effect be analogous to that of the Royal Agricultural Society itself. The most honoured names of the country might be connected to give it distinction, the wealthier landlords and farmers would endow it with scholarships and fellowships, while the cost of its annual examinations and degrees would be easily defrayed by the ordinary subscriptions or fees paid by the numerous and important class it is intended to serve. The colleges and the schools connected with it would, as in the case of the Devon County School, owe their foundation to local interests, and be maintained by the payments of students, with such assistance as the liberality of local benefactors might yield. And if, as I have ventured to anticipate, these schools and colleges were to supply from the sons of the independent classes well-trained and well-conditioned masters for the elementary schools as well as for their own, it would not be unreasonable to expect that some portion either of the Government annual grant or of the hitherto neglected or misused educational endowments of the country might be applied to provide subsidies, or, better still, retiring pensions for such masters.

Under such a system one might venture to anticipate a remarkable change in our agricultural districts. England would be England still, with no abrupt revolution in the habits or mutual relations of its several classes; but education, the improvement of man, would keep equal pace with other improvements. The rising wages of the labourer would enable him to afford that which the example and countenance of his employer would recommend—the education of his own children according to their station. The cost of suitable elementary schooling is now declared by authority to be 30*s.* per annum. Even this, if the parent paid it all, would in many districts be no disproportionate burden to the wages earned. But this 30*s.* includes a large estimate for the cost of educating teachers. This, according to the views I have advocated, might be entirely deducted if the teachers were by a different system drawn from a class who can afford to provide their own education. But the Government grants, though objected to by many, are so established and accepted that they are not likely to be withdrawn. The resources of charity also, whether by endowment or subscription,

* 'Public Schools for the Middle Classes,' by Earl Fortescue, Patron of the Devon County School. Longman and Co., 1864.

supply very large subsidies for the instruction of the labour child. There is, therefore, no reason why in every villag district in England a thoroughly good elementary school shc not be maintained at a cost of from 6*d.* to 9*d.* per week, cording to the number of children; and this cost may again reduced by a half or more by (1) the State grants, (2) volun subscriptions, or (3) the industrial earnings of the chil themselves. A school of 50 to 100 children thus maintai would offer to a master taken from the middle classes a hi proportionate salary than most curacies do to the sons of gentry; and if those elementary schools, instead of being as exclusively assigned to a dependent class, were so constit that the children of the employers might use them without in or loss of respect, then the masters of these schools, being th selves of independent parentage, would look to promotion higher salaries in the more important public boarding-sch to which some of their elementary pupils would proceed, where the bulk of the middle classes would be educated.

All who take an interest in the welfare of the English labo must rejoice at the attention that is now turned to the impr ment of their dwellings. But a still more important impr ment of the home must accompany the improvement of house. The true degradation of the labourer is his lack of respect. His sense of the value of those belonging to him sh accompany the sense which improved wages and dwellings give him of his own value to those in whose service he is pl To turn the hearts of the fathers to the children, and, by c quence, the hearts of the children to the fathers, is the method of "making ready a people for the Lord," which pl implies all, and more, than is commonly meant amongst u improvement. Writing in pages that may be read by son the most powerful employers of agricultural labour in Engl I shall be pardoned if I express myself warmly on this sub and claim for it a more serious attention than it has yet rece The parish school should be the special charge of every farmer quite as much as of the clergyman or the squire. should be the subject of his thoughts and of conversation his neighbours; for, whatever may be the value to him of machinery or inventions, let him be sure that there is none will more affect his prosperity as a farmer and his satisfactio a man than this machine for the cultivation of his labo Let him determine to assist in making it work, consta asily, and efficiently. Let him consent—I do not say scend—to take the requirements of his own younger chil a gauge of what his labourers' children also should rec Let him ascertai... not illiberally yet with practical econc

the necessary cost, and seek to apportion it fairly among the recipients. Let him not think that either charity or wisdom require us to *give* gratis food to the mind any more than to the body; but rather by every encouragement to make this food an object of general desire, within the reach of average industry. Need I say that by this very appeal I am supposing no low standard of education for the farmer himself? And yet, whatever may be the honourable exceptions to be found in certain individuals, or even certain counties or districts, I fear it is a truth too real to be disavowed that the low standard of the farmer's own education has been the principal impediment to his encouraging as he ought the education of those he employs.

West Buckland, South Molton.

APPENDIX.

DEVON COUNTY SCHOOL.

Debtor and Creditor Account, from the Foundation in 1858 *to the End of* 1863.

Dr.	£	s.	d.	Cr.	£	s.	d.
To 225 shares (25*l.*)	5,625	0	0	By old buildings ..	937	18	8
Mortage and loan ..	966	5	0	New buildings and land	4,345	8	8
Old buildings sold ..	315	0	0	Repairs of building ..	36	0	0
Supscriptions for play-ground	153	13	0	Furniture	879	15	5
Boys' payments	5,001	7	11	Books and advertisements	477	18	8
				Preliminary and incidental	267	3	6
				Salaries	1,071	7	10
				Board	3,957	19	1
				Balance	87	14	1
	12,061	5	11		12,061	5	11

Statement of Receipts and Expenditure on Revenue Account, for the Year ending December 31*st*, 1863.

Dr.	£	s.	d.	Cr.	£	s.	d.
Salaries	188	19	6	Charged to boys for board and tuition ..	1298	19	0
Board	995	11	6	Charged to boys for sundries	335	4	6
Books, including prizes	21	19	8	Donations for prizes ..	12	7	0
Repairs of building ..	36	0	0	Scholarships given by Rev. J. L. Brereton	9	15	0
Furniture	47	14	10	Balance	51	2	2
Advertisements	11	4	9				
Sundries	13	3	10				
Taxes and interest ..	46	5	1				
Sundries supplied to boys	336	13	6				
Scholarships	9	15	0				
	1707	7	8		1707	7	8

Four weeks' Housekeeping Account, from November 5 to December 3, 18

			£	s.	d.
Baker ..	.. 1,552	lbs. bread	11	15	4
Miller ..	.. 140	lbs. flour	1	3	0
Butcher	.. 1,055½	lbs. meat	26	1	11
Brewer	.. 36	gallons beer	1	16	0
"	.. 64	gallons cider	2	0	0
Coals ..	.. 75	cwt.	4	13	9
Dairy ..	.. ..	butter and eggs	4	5	2
"	.. 138	quarts of milk	0	11	6
Grocer	.. 14½	gallons of oil, &c. &c.	10	18	6
Green-grocer	..	potatoes and vegetables ..	3	19	4
Sundries	.. ..	.. ..	1	11	6
Washing	.. ..	.. ..	2	1	8
Wages..	.. ..	.. ..	6	18	0

	£	s.	d.			
				77	5	8
43 boys, four weeks at 8*s*. ..	68	16	0	74	16	0
3 masters " 10*s*. ..	6	0	0			
6 servants						
52 total.						

2*l*. 19*s*. 8*d*. excess on our average, but this included 2*l*. charged to t master for a private party.

1055½ lbs. of meat consumed by fifty-two persons in four weeks, b 36½ lbs. less than ¾ lbs. for each person per diem.

1692 lbs. of bread and flour, ditto, being about 1⅛ lb. for each pe per diem.*

Remarks by the Editor.

A few words of explanation gathered from the Appendi Lord Fortescue's Book may be of service, and first it may remarked that the scheme contemplates the creation of shares of 25*l*.; therefore 75 such shares are still to be dispo of; if these should be taken up the mortgage and loan might paid off, and a balance of 900*l*. remain in hand.

It appears that the aggregate of the boys' payments from first to the end of 1863 nearly balances the outgoings for sala and board; but for the year 1863, the boys' payments exc "Salaries" and "Board" by nearly 114*l*. In 1863 there w 0 boarders; the present year starts with 60.

The records of this institution show how it has gradua moulded itself on the requirements of the times and dictates of experience; and in this point of view it is interest o compare its existing financial position with the sche

* Mr. Brewer, steward to Earl Fortescue, examined these accounts f Aug. 15 to Dec. 31st, 1861, and certified that, allowing 9*l*. 10*s*. for extra exp at the opening of the new buildings, the expense for board, service, and wasl averaged 8s. a week for each boy, and 10*s*. per week for each master.

which Prebendary Brereton propounded in 1853 and expanded in 1858, as well as with the prospectus published in 1862.

In his letter of 1858, Mr. Brereton contemplated a large infusion of the "industrial" element, and whilst the proposed charge for a boarder, who did five hours' work on the farm, was 20*l.* per annum, he who did no work was expected to pay 45*l.*

It is very satisfactory to find that *actually* the question has been whether 23 or 25 guineas should be the total average charge, a small difference being made between the senior and junior classes.

The same letter proposed a graduated scale of charge for tuition for day scholars of from 5 to 10 guineas per annum.

The prospectus of 1862 assumes the following shape:—

	£	s.	d.
For buildings	4000	0	0
For furniture	1000	0	0
For advertising and preliminary expenses	500	0	0
For working capital	500	0	0
	6000	0	0

"The permanent school," it is there stated, "will, when completed, have cost 3000*l.*, and have ample convenience for at least 100 boarders;" some temporary wooden buildings with other incidental expenses had cost 1000*l.* The tentative process adopted in the formation of this school, though wise and prudent, was not conducive to ultimate economy. The excess of the actual expenditure over this estimate being mainly due to the expedient of "temporary buildings."

The board of the boys, including food, washing, and attendance, is estimated at 8*s.* per week, that of the masters at 10*s.*, for 40 weeks in the year. An additional sum of 1*l.* per head is added to cover casual expenses.

The Educational Staff consisted of a head master and three assistants.

The head master cost, including board and washing, 120*l.*, he had besides a comfortable house in the buildings. The undermaster's salaries and board amounted to 150*l.*; including extra masters, the cost of tuition made altogether 300*l.*

Annual repairs were estimated at 100*l.*; a liberal allowance. It was calculated on this basis that if the school were full, a dividend of 500*l.* on a capital of 6000*l.* would accrue.

Some of these items call for special consideration from those who would copy this model; a very little consideration and knowledge of the world is required to see that a great deal of labour of love is here performed, which is not and cannot be charged in the account. The sum of 300*l.* is but a poor pro-

vision for the instructors, if all the responsibility, the discreti and the ruling power required, is to be provided from this fu Apart from endowments, which are in contemplation, or g tuitous service, the payment of 5*l.* per boy, to provide a fund 500*l.*, is probably the lowest that can ensure efficiency; and t is a lower rate per head than Mr. Brereton contemplated 1858, when he included the cost of supervision on an extent scale in the account.

If we would make a separate estimate of the cost of *lodgi* we may reckon that to provide 5 per cent. interest on 60((300*l.*), with 140*l.* for repairs and taxes, 440*l.* in all, a paym would be required of 4 guineas per head from each boar besides a 1 guinea fee from, say, 20, day-boys.

The board, as we have seen, is set at 17*l.*; any estim therefore, for general application would probably allow—

	£	s.	d.
For board	17	0	0
For lodging	4	4	0
For tuition	5	5	0
	26	9	0

Or, say, 28*l.* for the senior class, and 25*l.* for juniors.

This review would be very incomplete without some ment of the endowment of the chaplaincy with 1000*l.* by the Earl Fortescue, as well as of the scholarships or prizes alre presented or in contemplation.

Prebendary Brereton now gives annually two scholarsh one of 15*l.*, the other of 10*l.*, and it has been so provided t his benefactions will be made permanent. The present I Fortescue has offered 500*l.*, and the late Hon. J. Fortescue 200*l.* for the endowment of scholarships connected with institution. The Bishop of Exeter gives a scholarship of 5*l.* knowledge of Holy Scripture.

W. H. Hooper, Esq., the Rev. H. S. Pinder, Lord Poltim and the Rev. W. Thorold have likewise given smaller be factions.

A residence of thirty years in the University of Cambri ves me some confidence in avowing my belief that in no o y could benefactions of this kind and extent have been m telling in our present social and intellectual position.

At Cambridge a scholarship of 10*l.* or 15*l.* a year is alr alueless, so little does it contribute to the sum of a poor scho necessary expenditure, while as badges of proficiency we l nough and almost to spare of such rewards. In a county sch scholarship in the usual sense, tenable for two or three ye

not merely an annual prize, would give continuity, as well as life to the course of study.

The bare mention of such scholarships is very suggestive to those who are familiar with the fate of such endowments at Cambridge and elsewhere. Here in many instances the unforeseen change in the value of money, in some, want of equity in the interpretation of Statutes, has converted that provision, which in primitive times was a fair maintenance for a scholar, into a trifling honorarium.

Hence Exhibitions to the Universities, which once served to leaven the grammar schools to which they were attached, now go a-begging, or are not filled up. These institutions once gave an adequate impulse to the education of the whole class of yeomen, when it occupied (relatively to the learned professions, to commerce, and to trade) a more important position than at present. We have, therefore, not so much to deal with a new want, as to meet the defects which decay, social changes, and abuses have wrought in a once sufficient provision.

It may be asked, Why not, as of old, connect such provision with the Universities? Various considerations, however, lead to the conclusion that it is easier, if not better, to create new machinery than to attempt to resuscitate the old.

Rightly or wrongly our ancient Universities seem hardly to desire to attract to themselves really poor scholars, unless they be of remarkable ability. Without a revolution in the social habits of the students, they could hardly there find a place; and such habits, if not beyond control, yield but slowly, and then to example or religious principle rather than to prudential motives; and, lastly, on such large and rich bodies any new influence must be exerted on a large scale if it is to be effectual.

If, then, we turn to such new institutions as that which "the genius of Mr. Brereton has planned, and his liberality, energy, and judgment has established,"* we may yet gather for them some useful warnings from the history of our old foundations.

The importance of endowments *in real property* will be one such lesson. If all our old benefactions had assumed this form instead of being often money-charges on real property, and if the proceeds had been equitably administered, in all probability the constitution of our body of students at the old Universities would have rested on a far broader basis than at present.

On such benefactions, however, the Statute of Mortmain imposes a salutary check. A special charter might remove such difficulty, but then it would further swell the list of preliminary

* Taken, nearly verbatim, from the late Lord Fortescue's inscription on Mr. Brereton's bust, presented by him to the Devon County School.

expenses, and it is a significant feature of the times that the estimate of 500*l.* "for preliminary expenses and advertisements" (on a total outlay of 6000*l.*) was even in the case of the Devon County School considerably exceeded.

In conclusion, let me express a conviction that, as practical men, our leading farmers will recognise the importance of a public school education for their sons; not so much for its promise of book-learning (*comparatively* a weak point) as for the presence of mind and stedfastness in difficulties, the power of coping with men, the promptitude of thought, word, and action, which such a course of training imparts and fosters.

P. H. FRERE.

Cambridge.

IV.—*Essay upon the Manufacture and Preservation of Cider and Perry.* By CLEMENT CADLE.

WORCESTER PRIZE ESSAY.

THE differences that are met with in cider and perry, even when made at the same time, by the same maker, and under the same system of management, must strike the merest tyro in the art as something strange, showing how very little is known of the scientific principles which regulate the conversion of the juice of apples either into a sweet, pleasant beverage, or into a hard, sour drink, palatable only to persons long accustomed to its use.

Having paid considerable attention to this subject, I shall endeavour, in the following Essay, so to combine "science with practice" as to render it acceptable to the most matter-of-fact farmer or maker, whilst, by drawing attention to the scientific aspect of the subject, I hope to induce others to put their shoulders to the wheel, with the conviction that such light may be thrown in various ways on the manufacture of cider and perry, as may render them, in their improved character, nearly equal to the wines of warmer climates.

The subject, according to the directions given in the announcement of the Prize, may be subdivided as follows:—

1. Time and mode of gathering the fruit.
2. Different modes of grinding and pressing.
3. The fermentation and after-management.
4. General remarks on the subject.

1.—*Time and Mode of Gathering the Fruit.*

Practice in these respects varies considerably at present, the most usual way being to let about one-half or two-thirds of the

fruit fall, and to shake and knock the rest off the trees; but by this plan the trees are much injured for the next crop.

The windfall should be kept apart from the riper fruit; and that this may be the better done, the ground should be carefully picked over once every second week, and the fruit kept separate in the apple-yard.

Any experienced person will be able to decide when the crop is ripe enough for being gathered; the mellowness of the fruit, and the ease with which it can be shaken from the trees, readily show this; and it is impossible to lay down any rule as to time, owing to the differences of climate, soil, and season.

When the fruit is ripe, and the day fine and dry, a careful man should be selected to go over the trees, armed with a light pole having a hook at the smaller end, with which he gently shakes each limb or branch in succession.

The fruit should then be carefully picked up, free from leaves or twigs, the small apples being put into separate baskets, to be taken to the apple-yard, for second-class cider; the best fruit may then be carted to the apple-loft. They should at first be spread in the loft about 12 to 18 inches thick, but after a week or nine days, may be thrown up to a depth of 24 to 30 inches. When the apples are moved for this purpose any rotten ones had better be removed to the mill, and any small or unripe fruit, which escaped notice at picking, should be taken to the apple-yard.

This process of shaking and storing should be repeated in about a fortnight; but where the orchards are large, when they are all once gone over, the men can commence again a second round. During the second process of shaking it is important that none of the fruit should be knocked off, as such, not being fully ripe, will not do for the apple-loft.

When the trees are gone over again for the third time, the remainder of the crop may be shaken off, no more violence being used than is absolutely necessary. This third gathering must not be taken to the loft, but should be put in the apple-yard with the sortings of the first and second gatherings, unless you happen to have plenty of room under cover. As this portion of the fruit did not ripen so early nor so fully as the rest, it is best mixed with the windfalls and sortings for making second-class cider. The general practice is to leave all the apples in the apple-yard exposed to the weather until ready for grinding, few persons having proper accommodation for housing them. When such a course is pursued, it is important to separate all rotten ones before making, for even if, as some persons consider, the black rot in fruit is alone injurious to the cider, still, it is always best to err on the safe side.

The fruit should not lie more than 2 feet thick in the heap, or

it is liable to become heated; and a depth of 1 foot would b preferable. In frosty weather it is essential to have the hea covered with a good coating of sweet wheaten straw, whic should be removed when the frost is gone; but hay must not b used, as it gives a taste to the cider.

Fruit is much injured by frost on account of its breaking u the structure of the apple. The juice becomes solid when froze and increases in size; the cells are then burst, and any rain whic afterwards falls upon the heap washes out the saccharine matt from the damaged portions, and this encourages decay in th other fruit.

To the management of pears the same remarks apply wit equal, if not greater, force, more especially as regards the remova of windfall and rotten fruits.

If the perry is required for bottling or long keeping, carefu selection of the fruit is imperatively necessary; but if for earl drinking, the same care need not be taken.

When it is desirable to preserve a portion of the fruit for eatin or culinary purposes, it should not be allowed to get too ripe o the trees; and generally, the longer it is intended that an appl shall be kept, the greener should be its state when picked.

The best mode is to take a ladder, and with a small bask hand-pick the trees over a fortnight or three weeks before th general crop would be ripe enough to collect for cider, choosin a dry day, and not commencing till after the dew is off.

The store-room should be dry and, if possible, on the groun floor, as the frost affects the fruit more in lofts, especially if n ceiled inside. The fruit should be placed between good thic layers of sweet wheaten straw, and left until required for use.

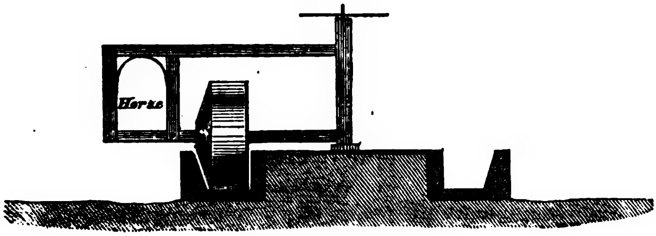
2.—*The Different Modes of Grinding and Pressing.*

Within the last few years a great alteration has taken place i the way of grinding in the counties of Hereford, Worcester, an Gloucester, by the adoption of a system which has long been th custom in Devonshire. Our old plan was to place 8 or 1 bushels of fruit in a circular trough (*a* No. 2), round which stone runner of about a ton weight was propelled by a horse (se Plan No. 1) until all or nearly all the kernels and the appl were ground to a fine pulp. To accomplish this the sooner, th boy attending to the horse had to move the partially-ground pul from the sides of the circular trough to the bottom. This grindir was usually continued for about two hours more or less, accordir to the mill and the fruit. The pulp was then put up into hors hair sheets and pressed, and the liquor running from it receive into a stone cistern or vat.

The cumbrous old-fashioned press, with its wooden screw ar

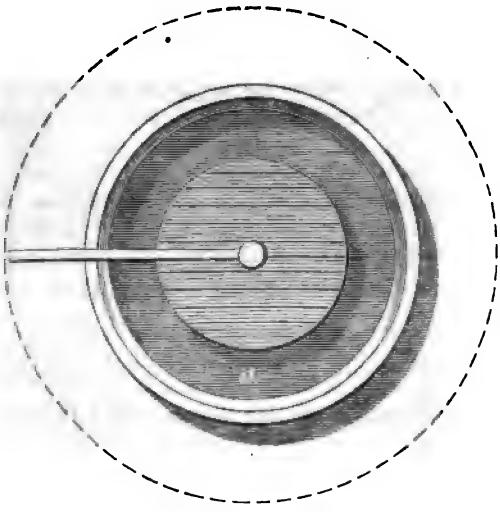
pstan, has long been superseded, although the capstan is still used in Devonshire.

No. 1.



Section of Cider Mill.

No. 2.

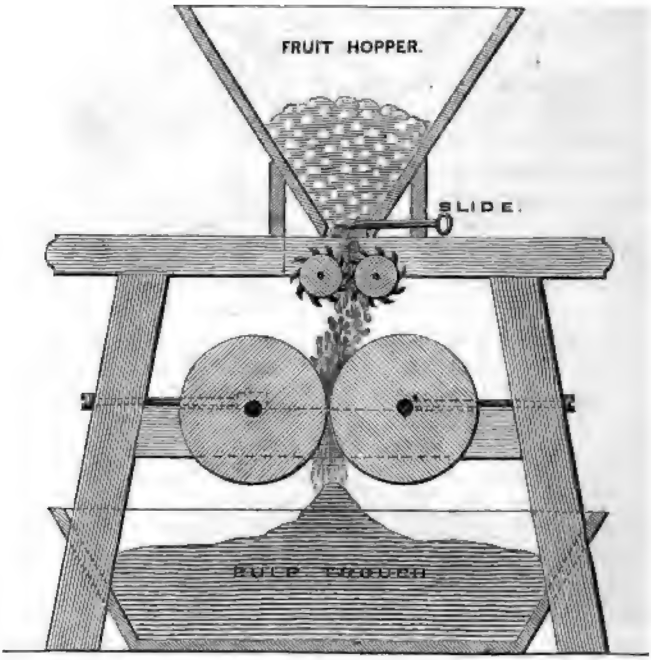


Plan of Cider Mill.
Scale 8 *feet to an inch.*

About 26 years ago Mr. Coleman, of Chaxhill, Westbury-on-Severn, commenced making an improved cider-mill and press, which could act either as a fixture or a portable mill. (See No. 3.) It was found that the cider thus made fined better, and the process was also more expeditious. These advantages, together with the cost of keeping the old kind of mills in repair, which landlords were unwilling to undertake, led to their being superseded, as they wore out, by Coleman's or a similar mill.

No. 3.

Mr. Coleman's Cider Mill.

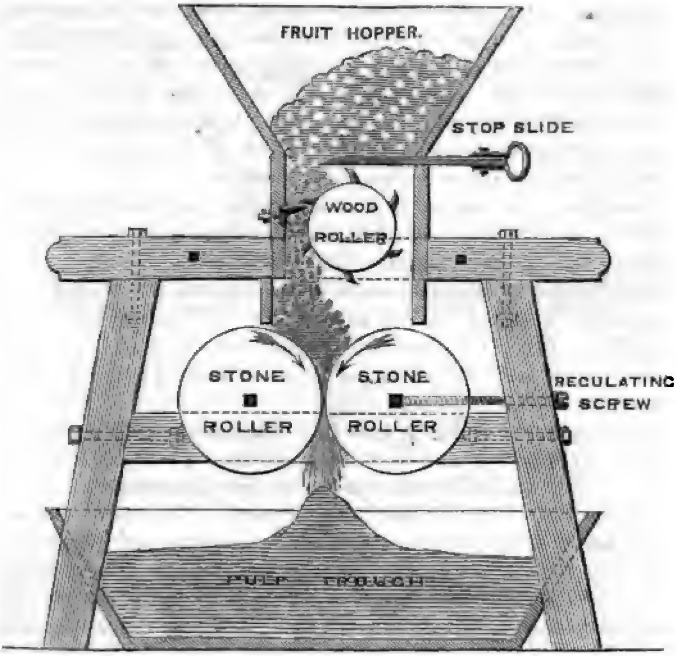


Coleman's mill consists of two pairs of rollers fixed in a strong wooden frame; it is fed from a hopper, the apples passing through the first pair of rollers, which are made of hard wood, with iron teeth, so as to break the apples, which fall next between a pair of stone rollers set close enough to break the kernels, and from these the pulp drops into a trough placed beneath to receive it.

Mr. Latchem, of Hereford, has also paid considerable attention to the construction of these mills, and has taken out a patent for doing away with the iron in the feed-rollers, and substituting steel teeth fitted into one roller, and working through other steel teeth on a fixed plate, partly on the same principle as a curd-mill. The fruit, after passing this "chewer," is ground between a pair of stone rollers, as before described.

The pulp is removed from this trough to the press, which consists of a very strong wooden frame made of four pieces of oak morticed together, having a platform made of strong planks wide enough for the "cheese" to be built upon it. Between the uprights [illegible] a mo[illegible]able cross-piece is placed, which is grooved

Cider Machine—P. Latcham's Patent.



Scale 1 *foot to an inch.*

at each end so as to work up and down a tongue on each upright of the frame. To the upper side of this cross-piece two screws are fixed which work into the top of the frame. The pressing the pulp is usually carried out in this manner:—A small box-frame is prepared by nailing together 4 pieces of board 8 inches deep, and of such length as the platform will conveniently allow. On such a box a piece of hair-cloth is laid, and this is filled with pulp; the corners of the cloth are then turned in, the box gently raised, and another cloth laid upon it, which, in its turn, is filled with pulp; and this is continued until the cheese is built up to the required height. We then place upon the cheese a square piece of plank which overlaps 6 or 8 inches on each side, and the screws being turned alternately, the pressure causes the liquor gradually to run on to the platform, which has grooves cut in it to convey the cider into a vat or tub, from which it is removed to the cask.

In Devonshire the system differs from this; their plan being to have an apple-loft over the mill, or pound-house as it is there called. A raised driving-way is provided at the back, so that a

cart can be driven up and tilted. The apples are thus easily g into the loft. Under this loft is the mill, which is fixed hig and fed through a hole opened in the loft; there is little oth difference except that in their mill the pair of upper rollers a of fluted cast iron. From this mill the pulp is placed in t press, as before described. Formerly, the cheese was built straw, but this has now given way to "cider-hairs;" and I a informed that the use of straw is now very rare.

The capstan seems to be still used there, and also the sin iron screw, but this has a catch at the bottom to prevent the scr running back on great pressure being applied.

Until the portable apple-mills became general, we had a m to almost every farm, and even to many of the cottages; but Devonshire one mill or pound-house serves for a number makers, and sometimes for a parish, each person paying so mu per hogshead for the making.

Most of the travelling portable machines in Herefordsh have two presses with each mill, and are worked by two hor making 1000 to 1500 gallons in a day; sometimes they worked by a small portable steam-engine. They are very ex ditious, and do very well for second-class cider, but if you wo have the best, they are very objectionable, because the differ sorts of fruit very rarely get ripe at once in sufficient quanti to enable you to make much at a time. Much cider is theref spoiled, the fruit being ground when too green, by those who impatient to finish the process. I think that each farm or hold should have a mill of its own, even if it be only a small hand-m

There are several other rude plans of grinding, such as r mills, graters, scratchers, &c., but they are so objectionable t they hardly deserve notice.

All metallic substances should be kept from contact with pulp, as chemical combinations immediately take place contact; for instance, if you take a clean knife and cut an ap through, the knife quickly becomes black, as well as the ap For this reason I think the iron teeth and cast-iron in the rol are objectionable, as also the steel ones, although perhaps no the same extent. I should recommend that this iron be remov and fluted rollers of larger diameter be made of some hard wo such as yew-tree, or American iron-wood. No doubt more po would then be required to work the mills, but this would be little consequence if the produce was first-class cider.

When this new mode of grinding was first tried, there great complaint amongst the labourers that the cider did agree with them, and this was generally attributed to the ir but in my opinion, the green state of the fruit when ground m the juice harsh, and caused irritation in the system.

The use of mangolds before they get ripened either by the action of the frost or by storing, appears to exert a similar unfavourable influence on stock.

One of the great errors in our present system of cider-making is that the pulp is pressed too soon after the fruit is crushed. Under the old system the grinding took several hours, and this delay was beneficial. Even now, most judges of cider will tell whether the cider is made on the old system or on the new: the latter creates such a peculiar harsh taste that many of the very best makers even now prefer the old mill.

Much of the flavour and richness of cider depends upon the fermentation commencing before the pulp is pressed, for by this means the essential oils in the kernels are extracted, and the juice becomes more perfectly prepared for producing a full-bodied cider. It has long been the custom in Devonshire not to press out the juice till the day after the apples are ground into pulp; and several makers have assured me that the best cider was that which was ground on Saturday and not pressed out till Monday. In our own district many makers under the old system, when they want to make some very prime cider, prefer letting the pulp remain all night before it is pressed. The adoption of this alteration may be strongly recommended; it only requires an extra vat or two to hold the pulp, whilst the improved result will, I am fully convinced, amply repay the little extra trouble involved.

In pressing the cider it is very important to take plenty of time, and do it gradually, for if the liquor rushes through the hair it takes with it much more sediment than is desirable: the clearer it is the better.

We may well take a lesson from the manner in which wines are fermented, as much as three or four days being allowed to elapse between the crushing of the grapes and the removal of the clear liquor, which is then allowed to run off as bright as possible.

When pressed for time many makers of wines crush and press their wines at once, making a white wine; but this is of inferior quality, since the colour, flavour, and aroma of the fruit can only be extracted by the slower process.

3.—*The Fermentation and After Management.*

In making cider it is very essential to have the fruit as ripe as possible, not only for the sake of the saccharine matter, but also of the essential oils derived from the ripe kernels, which influence the keeping qualities as well as the flavour of the cider.

Dr. Voelcker has kindly furnished me with the following analysis of some common Somersetshire cider, such as is used by agricultural labourers:—

Quantity per Imperial Pint.

	Grains.
Water	8292·41
Alcohol	367·69
Grape-sugar	31·67
Gum and extractive matters	45·05
Albuminous compounds	1·94
Malic acid	44·86
Mineral matter (ash)	18·38
	8802·00

The above analysis shows that a large quantity of malic aci is present in the cider, as well as in the apple in its natural stat and it is this acid which gives the rough taste so much relishe by cider drinkers, although in many writings upon this subje it is mistaken for either lactic or acetic acid.

The first point to be secured is by the proper exposure of th fruit to the sun to get the starch and pectin, which is largely con tained in unripe fruits, converted into grape-sugar as much a possible, and this change is further assisted by keeping the fru some time after it is picked. After breaking or grinding th fruit, the first change results from the combination of the oxyg of the air with some of the materials of the fruit, upon whic no doubt, the colour depends, for, according to Liebig, "we a able, to produce from malic acid and ammonia aspartic acid which is colourless and crystallized, produces, when oxygen present, by absorbing ammonia, the splendid red dye orcein."

When a ripe apple is cut or broken through and exposed to t air, it becomes of a beautiful red colour in a short time, probab from the same action. Should this theory be right, it affor another inducement to gather the fruit as ripe as possible, for w know that cider made of unripe fruit is of a pale colour.

From the albuminous substances in the fruit a vegetable fe ment is formed, which, after the vinous fermentation is over, is very essential to get rid of as completely as possible. Th ferment acts by changing the grape-sugar into alcohol and ca bonic acid, thus: 1 equivalent of alcohol consists of 4 equiv ents of carbon, 6 of hydrogen, and 2 of oxygen; 1 ditto carbonic acid of 1 equivalent of carbon, and 2 of oxygen; ditto of grape-sugar of 12 equivalents of carbon, 12 of hydroge and 12 of oxygen; and the change would be that each equivale of grape-sugar produces 2 equivalents of alcohol and 4 carbonic acid, thus :—

		Carbon.	Hydrogen.	Oxygen.
2 equivalents of alcohol (C_4, H_6, $O_2 \times 2$)	=	8	12	4
4 equivalents of carbonic acid (C, $O_2 \times 4$)	=	4	0	8
1 eq. of grape-sugar	=	12	12	12

Page 180, Letter 15, third edition.

But of the cause of this change I believe very little is known. Professor Fownes, in his Manual of Chemistry, p. 417, says, "It is certain that decomposing azotised bodies not only do possess very energetic and extraordinary powers of exciting fermentation, but that the kind of fermentation set up is in a great degree dependent on the phase or stage of decomposition of the ferment." He thus evidently thinks there are different kinds of fermentation resulting from the condition or character of the ferment.

In a conversation I have recently had with Dr. Voelcker upon this subject, he told me that the principal point is to get a right kind of fermentation, as each kind of ferment produces a like fermentation in the liquor to which it is applied. Thus, if you apply the vinegar-plant (commonly called "mothers") you get a vinegar or acetous fermentation; from a top yeast you get a top fermentation; from a bottom yeast, a bottom fermentation; from a ropy yeast, a ropy fermentation in the liquor to which it is applied. It has been said that each kind of ferment produces a separate and distinct plant of its own; and this might possibly account for the different kinds of fermentation in cider, which I will now proceed to explain, only premising that the *temperature* of the *air* and the *condition* of the *atmosphere* exert a powerful *controlling* influence on the character of the fermentation which is produced.

We will first notice the vinous fermentation. This has different stages. The first change we notice is that in which the liquid throws some of the sediment out at the bunghole, whilst another portion settles to the bottom, and this is often so completely done that the liquor remains clear and bright. When violent fermentation afterwards sets in it makes the cider or perry thick and turbid, even if bright before; and if this is allowed to go on it will spoil the cider in a few days. It is this second stage, or violent fermentation, which all cider-makers dread, and try to prevent, whilst the first they encourage as much as possible. This rapid or violent action is frequently mistaken for the acetous fermentation, because of the increased acidity of the liquor, which, however, may generally be traced to an excess of malic rather than acetic acid.

All cider-drinkers like the flavour of the malic acid; but no one likes the acetic acid, or sharp taste. Malic acid is the natural acid of the fruit, and as long as the sugar or saccharine matter is in excess only the sugar is tasted; but as the fermentation proceeds the sugar is gradually changed into spirit, and then the malic acid gets in excess, and you taste its flavour. This accounts for the fact which has puzzled many persons, that a cask of cider may be found sweet one day, but acid when tasted

the next day. The cider of which the analysis is already given contained 44·86 grains of malic acid to 31·67 of grape-sugar, consequently that sample no doubt tasted of the malic acid, which was in excess of the sugar; but in the apple itself there is 6·45 per cent. of sugar to ·11 of malic acid; hence all newly-made cider is sweet, and the greater the quantity of saccharine matter it contains the longer it will remain so, provided that the rapid fermentation is not allowed to go on. Malic acid, we have seen, is present in the apple before the juice is pressed; but the acetic acid does not exist until it is formed in the cider. You very seldom get it before May; and it is due either to the cask not being air-tight or to the cellar or place where the cider is kept being above 60° Fahr., unless, indeed, the cider should happen to be put in a cask which has some of the vinegar (or "mother") plant left in it, which will, of course, soon induce the acetous fermentation.

The third kind of fermentation is the slow fermentation: this is continually going on, even if the cider or perry is bottled, or otherwise kept free from contact with the air. This we cannot avoid, neither would it be advisable; for as the freshness of spring-water is due to the presence of carbonic acid, so likewise the sparkling properties of cider or perry arise from this gas—a product of fermentation without which they would be flat and unpalatable.

Some writers have supposed that malic acid is formed in the liquor as it matures by a gradual process of oxidation, such as the following series may represent: Alcohol (C_4, H_6, O_2); then aldehyde (C_4, H_4, O_2); then acetic acid (C_4, H_4, O_4); and lastly, malic acid (C_4, H_3, O_5).

But if this theory were correct, acetic acid must always exist before the malic acid is formed; whereas, *in fact*, the reverse is known to be the case. We must conclude that the malic acid exists naturally in the fruit.

The Management of Cider.

The juice, when pressed out, if it be intended at once to place it in the cask, should first be strained: an old cider-hair which has got thick from use may be fitted to the tunpail, and if a little coarse charcoal is placed in the bottom it will be all the better; the cider or perry should then be strained so as to separate all the loose floating vegetable matter. It should remain in this cask, and on no account be racked or touched until it is perfectly clear from working at the bunghole and from settlement to the bottom. Sometimes this fermentation will not commence without assistance, by the addition of a little of the active ferment from a cask that is working.

The vinous fermentation generally occupies a week or nine days, and sometimes even longer; but as soon as the must drops from the bunghole to the bottom, which will be in a day or so after it has finished throwing up, the liquor should be immediately racked into a fresh cask.

I should strongly recommend that the juice be strained into vats holding from one to three hundred gallons, and left there to ferment; for the ferment generally separates better there than in the cask; and the cider can be drawn off without disturbing the sediment at the bottom, or the scum and must floating on the top.

When this system is pursued it is very essential to remove the scum from the top; and great care should be taken that this is perfectly done, for on this depends much of the after-trouble. This scum contains an active ferment which is very liable to get mixed with the liquor on tunning it into the cask, and this is certain to cause trouble: the same may be said of the "settlings." In all cases, before using a cask, it should be well washed, and, if not sweet, should have the head taken out, be well scrubbed, and put to dry. When a cask is wanted, it is desirable, before using it, to take a brimstone match, or piece of brown paper on which some melted brimstone has been run; this, after being lighted, should be suspended by a piece of wire inside the cask, and the bung inserted. As soon as the oxygen of the air is exhausted it will go out; the remains of the match may then be removed, and the cask filled. This will take away any smell or unsweetness which the washing failed to remove, unless the wood be thoroughly saturated with bad gases, in which case nothing will thoroughly cleanse it, and the best way will be to direct the cooper to shave or pare the whole of the inside of the cask, and then let some freshly-ground must stand in it for a week or so, changing it every day. Too much care cannot be taken to have a clean cask, some hundreds of vessels of prime cider being annually spoilt from neglect in this respect. The liquor having now got over the vinous fermentation, and become clear, should be kept from the air as much as possible. The best means of accomplishing this is to place a bung in the cask, and, having bored a hole in it, fix a small tin tube with the longer end through the bung, and the shorter end inserted into a small tin can filled with water; the tube will allow the carbonic acid to escape, and will save your cask. Many persons recommend bunging the cider up at once; but in so doing you endanger your casks and the liquor. The accumulation of carbonic-acid gas consequent upon rapid fermentation would burst the cask, unless it should happen to be very strong; but the use of the tube, whilst it allows the gas to escape, pre-

vents the access of air, and also indicates the state of the liqu
It is so cheap as to be at the command of everybody, and on
requires a little attention to keep the water in the cans an in
or so above the bottom of the tube. If the supply of water
neglected, or if the tube is not properly fixed, the plan necessar
fails. The better to secure an air-tight joint, some clay shou
be moulded round the bottom of the tube next the cask.

The cider should be looked to every morning, when it will
easy to detect any case of rapid fermentation, by observing
rate at which the bubbles of carbonic-acid gas escape. In su
case the cider should be immediately racked into a fresh ca
the tube and bung being placed in as before. When the
system is adopted, and the casks left open, they should be go
over every morning, with a lighted candle in the left hand,
in the right a stick about a foot long. This stick should be s
at one end, and about an inch of candle inserted in the cl
This being lit from the candle held in the left hand, is lowe
to the bunghole of the cask. If the candle goes out, it sh
that carbonic acid is given off and fermentation is proceeding
rapidly; the cider must then be at once racked into a fresh ca
By this means, with ordinary care, any rapid fermentation r
be immediately detected, and kept under control. Should
liquor continue bright and clear till February, I should rec
mend that nothing further be done to it; but should it not
bright, it should then be fined with isinglass, &c., in the foll
ing manner:

Take an ounce of isinglass for each hogshead of cider,
place it to soak twenty-four hours in some cider or water, t
beat it up with a whisk until it becomes a thick gelatinous fr
fluid; then rack about half a cask of cider, mix the ising
liquid with a can full of cider, whisk them together, and p
into the cask, half filled with cider; then finish filling the
to within a couple of inches of the top or bunghole. In abo
week or nine days the cider should be racked off from the i
glass; and, should it not then be clear, the same process is to
repeated.

In Devonshire they use stewed or baked apples instead of i
glass. A sufficient quantity of large apples are put aside in
autumn, and, if the cider is not clear about the middle of Janu
or beginning of February some of the apples are baked or stew
then mashed and passed through a sieve to remove the co
rinds, and kernels. They then take about a quart of this pu
and apply it in the same way as the isinglass, already descri
Many consider that it does not impoverish the cider so muc
isinglass, but rather gives it something to feed upon. Thi
the cheaper process; I think it is immaterial which is used.

long as they are properly managed; each acts by slowly settling to the bottom, taking with it the matter floating in the cider. Cider should always be racked off from the isinglass or apples; otherwise, in case of a change of temperature, or other causes, the sediment has a tendency to rise in the liquor, and the fermentation recommences. Should this fining process not succeed the first or second time, it may be tried a third time: as soon as the cider is fine and racked off, it may be bunged up.

It is important to get this fining done in cool weather, and before February is out; because "alcohol does not combine with oxygen at a temperature of from 46° to 50° Fahr., and the affinity is but slight at slightly higher temperatures" (*Liebig*). We seldom get the acetous (or vinegar) fermentation before March, and hence the importance of getting the fining completed, and the cider free from fermenting matter, before this time, when a temperature of 55° to 60° will occasionally be reached. After the cider is bunged up a coating of well-tempered clay should be put on the bung, to close it more completely.

Many casks of cider are spoilt from neglect of this precaution, and also from using bungs made of porous wood, and in some cases from the bung not properly fitting the bunghole.

In the case of perry, some little differences may be made. The pears should not be allowed to get quite so ripe as apples (for they decay inside); and after the juice is pressed, it should be carefully watched after it is placed in the cask, as in from four to six days, or a day or two after the vinous fermentation commences, it will run freely through bags of very fine canvas, or brown holland. To render this straining more effectual the perry should be placed in open tubs, having some albuminous substance, such as blood, eggs, milk, or flour, mixed with it, and be there left from twelve to twenty-four hours. During this time the sediment and fermenting matter, if at the proper stage, will unite with the albuminous substance. In consequence of the difficulty of getting the liquid to run fine through the bags, conical bags slightly curved like a horn, are used, having a small hoop sewed on to the top of the bag: four, six, or eight of these are fitted to a frame. The perry should pass through these bags quite clear and bright in ten minutes after they are filled: to test the proceeding, let some be caught in a wineglass; if the canvas does not clear it sufficiently, some flour may be sprinkled on the inside of the bags. As soon as the bags are running perfectly clear and bright, the perry may be collected in a fresh tub; but all the previous running should be put by to be again passed through the bags.

This dropping of perry is a very simple operation, but it requires very great attention; care must also be taken not to touch or shake the stand while the process is going on. The clear

liquor is tunned into a cask, and the bags, after they stop ru
ning, are washed out and refilled in the same way; this bei
continued until the cask is completed. It may then be manag
in the same way as cider with the tubes; clarified with isingl
in February; and finally bunged up securely. Should the tul
not be used, it is not advisable to leave perry too much expo
to the air after being dropped. A piece of slate or other flat su
stance should be placed on the bunghole, otherwise the pe
may become so flat that it spoils.

Various systems are pursued by the merchants or persons w
make a business of fining cider, and sending it off to distant m
kets. They generally fix upon a store or cellar, and buy of
farmers at a certain fixed price on delivery at the store; some
them taking 50,000 to 60,000 gallons. As soon as the vin
fermentation is over, they watch it carefully, using the candle
before described. Should rapid fermentation set in, a few c
fuls of cider are put into a cask, and then a brimstone-match
burnt in it; the cask is then well shaken for five or ten minu
so as to mix the gas thoroughly with the cider in the cask. T
cask is then filled with the fermenting cider, and the proces
again and again repeated on every appearance of rapid fermer
tion, until the ferment is destroyed. If the cider is not fine a
clear, it is then made so, bunged up, and sent to the London a
other markets. Most of the cider that is "matched" in t
way has a peculiar taste, due to the gas (sulphurous acid) mi
with the cider, which is immediately detected by all cic
drinkers; it is consequently sent out of the neighbourhood.
merchants do not "match" all their cider, some of good qua
can generally be obtained, if specially ordered. I cannot reco
mend this method, except when every other plan has fail
The beneficial action of sulphur may be clearly traced to
production of sulphurous acid, which renders the ferment ha
less.* The sulphate of potash has the same effect.

The colouring of cider, which is requisite in some cases, es
cially with the produce of some soils, is generally effected w
burnt sugar. The sugar is placed over a very slow fire until
water is evaporated, being constantly stirred to prevent its beco
ing solid. A little may then be added to the cider until
required colour is obtained, which should be a rich amber t
Another method is to soak some chips of logwood in some wa
or cider, and add it to the cask. The simplest and best plan
to grow a few roots of purple beet with the mangolds; th

* Liebig explains that this sulphurous acid, having a greater affinity for oxy
than the substances which excite acidification or than the wine itself, withdra
from them, and in so doing, becomes converted into sulphuric acid.—*Letter*
p. 241, fourth edition.

may be ground like the apples and the juice pressed out. When the cider is racked, add from two to five quarts of the clear juice to each cask of cider, or a few may be placed in the mill, and pressed with the apples. I have seen a beautiful colour thus given to cider grown on dry sandy land, which would naturally have looked more like whey. Cochineal is also sometimes used.

General Remarks on the Subject.

I should recommend that the mill or cellar be built partially underground, for three reasons: 1st, To keep the temperature more on an equality in winter and summer; this should never exceed 55° Fahr., as whenever it rises to 60° Fahr. it favours the acetous change. 2nd, To facilitate the construction of a loft above for storing the apples, and of a raised driving way, which should, if possible, be on the south side of the building; all doors and windows to the cellar being on the north side. By this means the sun would be kept out, and the earth, by which the driving way is made, would keep the south side cool during the summer months. The third reason for this plan is, that the farther the cider is from the roof the better; and this roof must on no account be covered with slate, but with some light-coloured tiles or thatch, which will not draw the heat. The loft above can be used as a granary at other seasons of the year.

In recovering sharp or rough cider, it is a good plan to boil a few pounds of hops in some water, and pour them into the cask. If some molasses, treacle, or honey is added to the hops the improvement will be still greater; chalk may also be used for the same purpose. If lime is used, it must be exposed for a long time to the air; otherwise, by taking up the carbonic acid, it will make the cider very flat. Rossiter's and other compounds are largely used for this purpose; their active properties are, however, all derived from lime or chalk. These only partially *recover* the cider: our object must be to make it good and keep it so.

Most of the cider-merchants employ a saccharometer to detect any tampering with the juice before it is brought to them. This instrument gives the amount of saccharine matter. The density of the juice generally runs from 1070 to 1080—water being 1000. Various modes have been adopted to raise the proportion of saccharine matter, but without any real practical benefit. To test the use of sugar (which I suggested in my Essay upon the Making and Management of Cider, written for the Herefordshire Agricultural Society, in 1859) I made three hogsheads of cider the same day, and treated all alike; into one I put 20 lbs. of lump sugar, into the next 8 lbs., the other being left without any. The after-management was identical; and when I tried the cider, in six months' time, the cask with the 20 lbs. of sugar was no sweeter

than that which received none ; but it was exceedingly strong. am therefore disposed to recommend the adoption of a goc system of manufacture, rather than the use of sugar or spirit, add an unnatural strength to cider.

In this essay I have very freely stated my views, in the hop already expressed, that the attention of others may be drawn the subject, which is well worthy of the attention of the farme of Worcestershire, Herefordshire, and Gloucestershire. I a satisfied that the quality, and consequently the market value, cider may be very much improved ; but at the same time I mu add that the personal superintendence of the master is imperative necessary ; for the first and last rule, as regards cider-making, for the master to attend to it himself and not leave it to his me

In conclusion, I will give the system pursued by Mr. Hill, Egleton, near Ledbury, who took the prize at Hereford, in 18: for the best hogshead of cider, and is noted for producing fir class cider. He says, "the best sorts of fruit are the Roj Wilding, Foxwhelp, White Beech Normandy, Yellow Sty Handsome Mandy, and Skyrme's Kernel."

He uses mixed sorts of apples ; and when these are mell they are well ground in an old-fashioned mill. The liquor is th strained, put into a cask, and racked as soon as fermentati takes place, and this is done again on every appearance fermentation. After some weeks, if it is not bright, an oun of isinglass is added, and this is repeated once a fortnight un the cider is quite as bright as sherry wine.

On each occasion of racking, the sediment or grounds are plac in tubs, mixed with some albuminous substance, and dropp through some bags ; a canful, or sometimes two, of these dro pings is put to each cask after it is racked. Some hogshea require three doses of isinglass, &c. ; others not half as muc This, of course, depends upon its fermentation. Cider, to rich and full in the mouth, fit for bottling, should be allowed ferment as little as possible.

By these means he has made cider and sold it as high as per gallon. He also told me that, as many of the old sorts apples are going out, it is considered that they may be renew by continual regrafting upon young stocks. Thus, take as go a graft as you can get, and put it on a good thriving stock ; a then in a year or so take another graft from this and put it another stock, and so on. He has tried some three or four su cessive graftings in this way, and each time the tree sho more energy than the preceding one.

Ballingham Hall, Ross.

V.—*Report of Experiments on the Growth of Wheat for* 20 *Years in succession on the same Land.* By J. B. Lawes, F.R.S., F.C.S., and J. H. Gilbert, Ph. D., F.R.S., F.C.S.

The records of a field of 14 acres in which wheat has been grown without manure, and by different descriptions of manure, year after year for twenty successive seasons, without either fallow or a fallow crop, and in which the lowest produce was in the first year 15, and in the last 17¼ bushels, and the highest in the first year 24¼, and in the last 56½ bushels, cannot fail to be of much interest at once to the practical farmer, to the economist, and to the man of science. Accounts there have been before, of the growth of wheat for many consecutive years apparently with great success, and without much evidence of exhaustion, on soils of admittedly extraordinary fertility; and the recent experience of the Rev. S. Smith, of Lois Weedon, has shown that, on his soil at least, many wheat-crops can be taken, under a system of alternate crop and fallow, without reaching, at any rate for many years, the point of deterioration. History also tells us of large tracts of land on which the wheat-crop has been cultivated year after year for many years, but which have eventually succumbed to the unnatural strain put upon them. The records to be laid before the reader in the present paper refer to conditions of growth like in some points, but essentially different in most, to those of the cases to which allusion is here made.

The experiments have been made upon what may be called fair average wheat-land. But, as the rental of similar land in the immediate locality ranges, and has ranged for many years past, only from 25*s*. to 30*s*. per acre, tithe free, and its wheat-crop under the ordinary management of the district certainly does not average more than from 25 to 27 bushels per acre once every five years, it is obvious that, in a practical point of view, it can lay no claim to extraordinary fertility, or to be ranked on a higher level than a large proportion of the soils on which wheat is grown with a moderate degree of success under a system of rotation and home manuring. Such, in an agricultural or commercial point of view, were the general characters of the land. Speaking still in agricultural language, it may be said that the soil is a somewhat heavy loam, with a subsoil of raw yellowish red clay, but resting in its turn upon chalk, which provides good natural drainage.

The questions arise:—What are the grain-yielding capabilities of such land?—what its powers of endurance?—in what constituents, or class of constituents, does it soonest show signs

of exhaustion?—and how far will the answers arrived at these points in reference to it, accord with, or be a guide those which would apply to any large proportion of the ara land of Great Britain when farmed in the ordinary way, w rotation?

When this Journal first appeared, now five-and-twenty ye ago, such questions as these were hardly thought of, except by a few philosophers and economists whose speculations w scarcely heard of, and still less heeded, by any considera number even of the most intelligent of agriculturists. Since t period, however, matters have very much changed; and history of the change shows it to have been due to by no me one cause alone. Almost coincidently, or at any rate follow very closely upon one another's footsteps, and each react upon the other, the increase of population, commercial freed and competition, a vast increase in scientific knowledge, extensive diffusion both of it and of information of a practi kind bearing upon the farmer's art, have contributed to wide-spread spirit of enquiry of the present day on such subje

But it is especially to the laborious investigations on a cultural chemistry of Boussingault, and to the generalisations Liebig to a great extent founded upon them, nearly a qua of a century ago, that we must attribute much of the stim and direction that has been given to chemical enquiries in nexion with agriculture in recent times.

As bearing upon the plan adopted in our own experiment may be well very briefly to recall attention here, to the stat knowledge and opinion on some important points, about time of their commencement, and during the earlier year their progress.

Leaving out of view the many important preliminary po established by others, which were essential as a starting-p for Boussingault's researches, it may be stated that already be 1840, that indefatigable and most careful experimenter had de mined, as far as the then known analytical methods permit the amounts of the most important constituents of agricult produce put upon the land in the manure, and taken off in crops, through several courses of rotation. His more impor conclusions, stated in a very few words, were—that much m carbon and nitrogen were removed in the crops than were s plied in the manure; that the best rotations were those wh accumulated the most of those constituents from the atmosph that some plants, especially Leguminosæ, accumulated m nitrogen from the atmosphere than others, and not only c tained more in their removed produce, but by their residue the land richer in nitrogen than it was before; and that

value of manure was to a great extent measurable by the amount of nitrogen it contained.

In Liebig's first work on 'Organic Chemistry in its applications to Agriculture and Physiology,' published in 1840, he illustrated, more pointedly than Boussingault had done, the importance of the incombustible or ash-constituents; which, to distinguish them from carbonic acid, water, and ammonia, from which the organs of plants were in great part formed, he designated as "inorganic" substances. He, at the same time, also insisted strongly upon the importance of the nitrogen, or ammonia-yielding matter, of manures.

Soon after the appearance of Liebig's work, Boussingault published, much more fully, the results of his own agricultural investigations, and the conclusions deducible from them, bringing out more prominently his views as to the importance, in a practical point of view, of the nitrogen in manures.

Liebig followed with a new edition in 1843, in which he criticised Boussingault's experiments; condemned his notion of the relative importance of the nitrogen of manures; maintained (in direct opposition to the view put forward in his former edition) that the atmosphere afforded a sufficient supply of nitrogen for cultivated as well as for uncultivated plants; argued that this supply was sufficient for the cereals as well as for the Leguminous plants; that it was not necessary to supply nitrogen to the former; and insisted very much more strongly than formerly on the relative importance of the incombustible, or, as he designated them, the "inorganic" or "mineral" constituents. He even went so far as to say:—

"Is fertility not quite independent of the ammonia conveyed to the soil? If we evaporated urine, dried and burned the solid excrements, and supplied to our land the salts of the urine, and the ashes of the solid excrements, would not the cultivated plants grown on it—the gramineæ and leguminosæ—obtain their carbon and nitrogen from the same sources whence they are obtained by the gramineæ and leguminosæ of our meadows?

"There can scarcely be a doubt with regard to these questions, when we unite the information furnished by science to that supplied by the practice of agriculture."—3rd Ed., p. 204.

Again—

"The crops on a field diminish or increase in exact proportion to the diminution or increase of the mineral substances conveyed to it in manure."—3rd Ed., p. 211.

Somewhat later, he said—

"It has been demonstrated that ammonia is a constituent part of the atmosphere, and that as such it is directly accessible and absorbable by all plants. If, then, the other conditions necessary

to the growth of the plants be satisfied—if the soil be suitable, if it contains a sufficient quantity of alkalies, phosphates, and sulphates, nothing will be wanting; the plants will derive their ammonia from the atmosphere, as they do carbonic acid. We know well that they are endowed with the faculty of assimilating these two aliments; and I really cannot see why we should search for their presence in the manures we use."

". . . . . The question of the necessity for ammonia in ou manures resolves itself into the question of the necessity fo animal manures, and upon the solution depends the entire futur prospects of agriculture; for as soon as we can dispense wit bulky farmyard manure, by the use of artificial preparations, th productive power of our fields is placed in our own hands."

Our former papers published in this Journal have shown tha the results of direct experiment, as well as the general exper ence of agriculture as practised in this country, are in the mai confirmatory of the conclusions of Boussingault, and condemna tory of those of Liebig, as above quoted; and the records continued investigation given in this paper will afford furth evidence in the same direction, in reference to some of the poi in question.

In his more recent works, however, Baron Liebig substantia affirms much of what we have from time to time maintained correction of his own special doctrines. One example w suffice. In his most recent work—'The Natural Laws of Hu bandry'—in the course of a good deal of illustration beari upon the point, he says:—

"It is easy to see that the accumulation of nitrogenous food farmyard manure in the uppermost layers of the ground, so ve important for the perfect growth of cereal plants, must chie depend upon the successful growth of fodder plants."

Here, then, in direct contradiction to the views embodied the sentences above quoted from his earlier writings, Bar Liebig now maintains the importance of the growth of fallc crops as a means of providing nitrogenous manures for t growth of the cereal grains. He does so, however, not on without any acknowledgment of previous error on the poi out, as in other instances, seeks to cover his change of vie by putting forth his present opinions as apparently only t necessary consequences of general or abstract principles la down by himself, and by misrepresentation and ridicule of tho whose corrections he adopts.

Prior to the appearance of Baron Liebig's work in 18 numerous experiments, to a great extent suggested by a study De Saussure's researches on vegetation, had been made, on

small scale, at Rothamsted, on the effects of various mineral and other substances when applied as manure to a variety of agricultural plants. The most marked result observed in these early trials was the very striking increase in the rapidity of growth of certain plants when earthy phosphates decomposed by sulphuric acid were employed.

In 1843, it was decided to make experiments at once more systematic and on a larger scale, on some of the most important crops of our rotations, to determine, as far as possible, the relative or characteristic dependence of each, on the soil, the atmosphere, and manure. Boussingault's researches had been designed to ascertain what constituents were furnished, respectively by the soil, the atmosphere, and manure, to the aggregate of crops forming a rotation, rather than to each description of plant individually; and he himself says that his plan and results were silent on the latter point, though there is no doubt they did, at the same time, afford some very trustworthy indications in relation to it.

Of the new series of experiments made at Rothamsted, the first commenced was on turnips; and in accordance with the results previously obtained on a small scale, and apparently quite consistently with the views put forth by Liebig as to the relative importance of supplying the mineral constituents, the effects of the phosphatic manures were most striking, especially in the early stages of growth; though, when the experiments of the first year were concluded, it was found that certain organic manures had very materially influenced the final amount of produce.

For the experiments upon wheat, a field of 14 acres was selected, which had grown turnips, barley, peas, wheat, and oats, since the application of manure, and would, therefore, according to the ordinary rules of practice, be considered so far exhausted as to require to be re-manured before growing another crop.

It was thought that a field in such a condition was peculiarly fitted to show in which of the constituents of the crop to be grown the soil had become practically the most deficient by the removal of the five preceding crops; and that, if, on some plots of the land, in this agricultural sense exhausted, certain constituents of farmyard manure were supplied separately, on others in combination, and if, on others by their side, the crop were grown respectively without manure, and with farmyard manure itself, the comparative results obtained would far more satisfactorily indicate what constituents were the most exhausted, so far as their available supply for the crop to be grown was concerned, than any analysis of the soil could do.

This view has been fully confirmed, not only by the results obtained on the plan adopted, but by those obtained by others

who have attempted to determine on what depends the productive condition of a soil, by means of the chemical analysis of soils of different physical characters, and of known different productive qualities. The opinions of Professor Magnus, put forth some years later, in his report upon forty-two analyses of soils made under the auspices of the Landes-Oekonomie Kollegium of Prussia, to which he was then chemist, abundantly confirm the propriety of the decision at which we arrived, after a very careful consideration of the subject at the commencement of our experiments.

Our conclusion, as indicated in former papers, and frequently expressed in answer to the objections of chemical friends who had not paid special attention to the applications of chemistry to agriculture, was, that far more had yet to be done in determining the chemical and physical qualities of soils in relation to the atmosphere, and to manurial substances exposed to their action, as wel as in perfecting methods of analysis, before comparative analyse could aid us much in deciding upon the relative productiveness o different soils, to say nothing of the still more difficult problem o estimating, by such means, the condition of fertility or exhaustio of one and the same soil at different times. Of late years ver much has been done in these departments of investigation; still as recent discussions abundantly show, far too little is even ye known of what a soil either is or ought to be, in a chemical poir of view, to render the results of the analysis of soils directl applicable to the solution of questions such as those we had i view in our enquiry. But if our knowledge of the chemistry soils should progress as rapidly as it has during the last twent years, the analysis of a soil will ere long become much mo significant than it is at present.

In the mean time, therefore, the synthetic rather than the an lytic method was relied upon. And it was with the strikin effects of the mineral manures upon the still growing turnip-cro under our view, and wishing to test more fully the recently-pr mulgated doctrines of Liebig, that the plan of the first of th twenty years of experiments with wheat was arranged. Under th influence of such experience, and of such theoretical consider tions, "inorganic" or "mineral" manures of some kind we applied to almost every plot, and nitrogenous ones to very fe Without anticipating in these preliminary remarks the resul which will be given in detail further on, it may be stated gen rally, that in this first season scarcely any increase whatever w obtained from the exclusive application of any of the so-calle mineral manures; whilst, wherever nitrogenous manures we employed the effect was very striking.

Naturally enough much more nitrogen (as ammonia or in so

other available form) was employed in subsequent seasons; and so marked have been its effects, that the interest of the investigation may be said almost to begin and end with the consideration of the influence of that important constituent of manures on the amounts and character of the produce obtained, in immediate or succeeding crops, according to the quantity employed, to the condition of the land in regard to the supply of available mineral constituents, and to the characters of the seasons.

The Field Experiments.

The particulars of the manuring and produce of each of the experimental plots, in each of the twenty years over which the experiments have extended, are given in detail in Tables I. to XXI. inclusive, in the Appendix; and in Tables XXII. to XXVI. inclusive, also in the Appendix, are given some of the most important results in a more collective form. Those voluminous records, as above classified, show, respectively, the effects of one manure compared with another in each season separately, and the great difference of effect of the same manure in one season compared with another, and its increasing or diminishing effect when used year after year on the same plot.

It will be obvious, however, on a very little reflection, that the question of the relative condition of exhaustion of the different plots cannot be satisfactorily considered by reference to the amounts of crop alone. To deal adequately with this part of the subject, the consideration of the chemical composition, as well as the amount, of the produce is obviously essential. Accordingly, the proportions of dry substance, and of mineral matter, in both the corn and the straw, of each plot, in each of the twenty years, have been estimated. The proportion, and amount per acre, of the nitrogen, and the composition of the ash, in both corn and straw, have in many selected cases been determined. The percentage of nitrogen in the soil of some of the plots, at different stages of the progress of the experiments, has also been estimated. The mere tabular record of these results of analysis would occupy nearly as much space as those relating to the experiments in the field; whilst the discussion of them, in their manifold and important bearings, would supply matter more than sufficient for a single paper. It is proposed, therefore, on the present occasion, to leave out of view the analytical results altogether, and to confine attention, almost exclusively, to the more salient points of interest brought out by the results of the field experiments alone, leaving the detailed treatment of the question of exhaustion to a future opportunity.

The question of the climatic characters of the different seasons, and of the connexion between these and the amount and character of the produce yielded, would also require, for its due illustration

and elucidation, the discussion of such a vast amount of meteoro-logical record, and is, moreover, one of such intricacy, that it would be impossible to treat it at all satisfactorily within the limits that might otherwise have been devoted to so interesting and important a branch of the subject in the present paper. Th consideration of the influence of season will, therefore, on th present occasion, be limited to pointing out, as matters of fact the most prominent characteristics of the respective seasons, an the very great difference in the amounts and in the characters c the produce obtained under otherwise comparable conditions c growth, but in different seasons.

Incidentally, however, the results brought out under this hea will enable us to form some judgment as to whether the earlie or the later seasons of the experiments were, upon the whole the less or the more favourable; and, therefore, whether a increased or diminished result from the use of the same manu through successive years, is to be attributed mainly to the cumu lative or the defective character of the manure itself, or, in an material degree, to a progressive or retrogressive character of th seasons.

General Description of the Manures employed.

Having regard to the constituents of the ash of wheat-grai and of wheat-straw, it was sought to supply potass, soda, lim magnesia, phosphoric acid, sulphuric acid, chlorine, and silic respectively, in the most available and convenient forms. Om ting from the enumeration the amounts of mineral constituer provided in farmyard manure, cut wheat-straw, rape-cake, & or in the ashes of farmyard manure or wheat-straw, the mc direct supply of the above-mentioned substances was as under :

Potass—As pearl-ash, sulphate of potass, or silicate potass.

Soda—As soda-ash, or sulphate of soda.

Lime—As sulphate, phosphate, and superphosphate.

Magnesia—As magnesian lime-stone, or sulphate of ma nesia.

Phosphoric Acid—As bone-ash; generally acted upon sulphuric acid in quantity sufficient to convert a co siderable portion of the insoluble earthy phosphate lime into sulphate and soluble superphosphate of lime.

Sulphuric Acid—As sulphate of potass, soda, or magnes in the phosphatic mixture last mentioned, &c.

Chlorine—As hydrochloric acid (with bone-ash), or chloride of sodium (common salt), &c.

Silica—As artificial silicate of potass; formed by fusi gether equal parts of sand and pearl-ash.

In accordance with the nomenclature employed by Liebig, and generally adopted by writers on agricultural chemistry, all the above are, for convenience, distinguished as "inorganic" or "mineral" manures. Professor Hofmann* has, however, recently suggested the term *cinereal* (from *cineres*, ashes) to designate those constituents which are found in the ashes of plants. Although, undoubtedly, far more appropriate than the terms "inorganic" or "mineral," the attempt to substitute it now would be fraught with more inconvenience and confusion than advantage. Liebig himself, has, indeed, of late, sought to repudiate the use of the term *mineral* in the restricted sense in which he had habitually used it in agricultural discussions. He has even attempted, by means of direct misquotation, to fix the origination of the distinction upon ourselves.†

Other constituents have been supplied as under:—

Nitrogen—As sulphate, muriate, or carbonate of ammonia, or nitrate of soda, of commerce; in farmyard manure, and in nitrogenous organic matter, such as rape-cake, &c.

Non-nitrogenous organic matter, yielding by decomposition carbonic acid, and other products—In rape-cake, rice, tapioca, and also in straw and in farmyard manure.

The artificial manure or mixture for each plot, was generally ground up with a sufficient amount of clay-ashes to make it up to such a fixed measure per acre as would facilitate its equal distribution over the land. In the earlier years the mixtures so prepared were sown broadcast by the drill; but they have for some time past, with proper precautions, been distributed by hand, as it was found that in that way the application of an exact amount of manure to a limited area of land could be best accomplished. Now, however, a drill has been constructed expressly for the purpose of the application of the experimental manures.

The field of 14 acres was at first divided into plots of which most consisted of two lands (each about 12 feet 5 inches wide) running the whole length of the field, and comprising together nearly two-thirds of an acre. After the second season, however, the double-land plots were each divided into two; though, in most cases, the two were similarly manured, thus providing duplicate experiments with the same manure.

* 'Reports of the Juries' of the International Exhibition of 1862; footnote, pp. 159, 160. Professor Hofmann has also, in his capacity of International Reporter, passed a judgment on the controversy between Baron Liebig and ourselves; fortunately, however, Baron Liebig's own works, and our own papers in this Journal, and elsewhere, remain in enduring protest against his misstatement of the issues, and his caricature of our own opinions.

† For further evidence on this point, see footnote at pp. 506-8 in the last number of this Journal; also pp. 447, 448, and context, Vol. xvi.

In the earlier years of the experiments the manures were ea season allotted with a view to the settlement of certain individi points; such, for instance, as the effect of individual mine manures, the necessity or otherwise of providing carbonace organic matter, and the effect, on the one hand of a deficient partial, or on the other, of a full or excessive, manuring in season on the crop of the immediately succeeding season. T allotment was always made with more or less of special refere to the previous manuring and produce of the respective pl but, unfortunately, not with that full appreciation of the desiral ness of maintaining exactly and easily comparable relati between one plot and another for a long series of consecut seasons, which, in this hitherto untrodden path of inquiry, co only be attained by a careful study of the results from tim time obtained.

The manures applied on one and the same plot were, ind much more uniform from year to year after the first three even in many cases after the first two years of the experime There were, however, still some variations in the descript and more in the amount employed on the same plot, even u the eighth year inclusive; though, during the last four of th there were comparatively few the effect of which would b interfere materially with the comparative character of the re obtained in subsequent seasons.

In the ninth year it was definitively arranged to sup throughout the field, the same manure year after year, on same plot, for many successive seasons, so as to trace r clearly the point at which one or another constituent became hausted, or in excess, in relation to others, or to the requirem for the production of a maximum crop.

It is obvious, therefore, that when comparing the re obtained on one plot with those of another in the ninth and el succeeding seasons, the previous history of each plot mus taken into consideration. Numerous illustrations will, indee given of the effects of the unexhausted residue of nitrogenous mineral manures applied in preceding seasons, on the amoun produce obtained in succeeding ones; not only, however, a view to the more correct interpretation of the results obta in the later years of these experiments, but also on account o great practical importance of the question. But it will be w we come, on a future occasion, to discuss the deficiency or e of certain constituents by the aid of analysis, that we shall more fully into the chemical statistics of each individual than is necessary, or even desirable, in presenting the outli the results in their more practical bearings which it is prop to give in the present paper.

The Field Results.

In former numbers of this Journal (vol. viii. part 1; vol. xii., part 1; and vol. xvi., part 2), the most important of the results obtained in the earlier years have been discussed; and to those papers, and to the detailed records given in the Appendix Tables at the conclusion of this paper, the reader is referred for any more than the very brief notice of the experiments of the first eight years which can now be given.

On the present occasion the results of the whole 20 years will be treated of under the following separate heads:—

First.—*Amount and character of the produce obtained under the different conditions of manuring, in each of the 20 years; with brief reference to the characters of each season.*

Second.—*Effects of the unexhausted residue from previous manuring (both nitrogenous and mineral) upon succeeding crops.*

Third.—*Average annual result over the last 12 years, by each description of manure applied year after year on the same plot.*

Fourth.—*Amount of ammonia in manure required to yield one bushel increase of grain (with its proportion of straw), according to the quantity applied per acre, to the available supply of mineral constituents within the soil, and to the season.*

Fifth.—*Concluding observations; showing the practical bearings of the results.*

I.—Amount and Character of the Produce obtained in different Seasons.*

First Season, 1843-4.

The winter of 1843-4 was unusually mild until the end of January. February and March were cold, wet, and stormy. April and May were unusually dry, with some warm weather, but a good deal of cold easterly wind. June was variable as to temperature, with scarcely any rain throughout the greater part of it, but a good deal towards the end of the month. July was wet, but with more than the average temperature, especially during the last week. August was almost throughout colder than usual, and excepting towards the end, windy and wet. In September a moderate amount of rain fell, but the weather was, upon the whole, warm and favourable. The dew-point and the degree of humidity of the air were, in June below, and in July about the average; in August the dew-point was low, but with the prevailing low temperature the degree of humidity was high; and in September both dew-point and degree of humidity were above the average.

* The references to the characters of the seasons, and of the wheat-crops of the country, may be taken as applicable, so far as such brief and general statements can be, to a considerable portion of the Midland, Eastern, and Southern counties of England.

With these characters of season, which proved extremely adverse to grass and spring-sown crops, the wheat-crop was reported to be generally well got in, and to be one of the largest in bulk and yield for many years past.

The amount and character of the produce obtained in the experimental field is sufficiently indicated by the following summary of the results yielded on some of the most important plots :—

TABLE I.—SUMMARY of the Results of the FIRST SEASON, 1843-4.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	15	0	58·5	923	1120
14 tons Farmyard Manure (Plot 2)	20	1¾	59·3	1276	1476
Ashes of 14 tons Farmyard Manure (Plot 4) ..	14	2¼	58·0	888	1104
Mixed Mineral Manure alone; mean of 9 plots (5, 6, 7, 8, 10, 12, 13, 14, and 15)	15	2¾	61·0	1009	1155
Mixed Mineral Manure, and 65 lbs. Sulphate of Ammonia; mean of 3 plots (9, 16, and 17) ..	19	1¾	62·3	1275	1423
Mixed Mineral Manure, and 80 lbs. Sulphate of Ammonia (Plot 19)	24	1¼	61·8	1580	1772

It will be observed that notwithstanding the very favourable report of the year's crop, the produce in these experiments was, without manure only 15 bushels, and with farmyard manure scarcely 20½ bushels of dressed corn, with proportionally small amount of straw. These low results afford satisfactory evidence that the land was in a condition of practical or agricultural exhaustion and hence, that it was well fitted for the purpose of experiment the object of which was to show in what constituent, or class of constituents, the soil had become, by the previous course of cropping, the most deficient, so far as the requirements of the wheat-crop were concerned.

It is specially worthy of remark, too, that on land in this condition, the ashes, or mineral constituents, of farmyard dung gave no increase whatever, and artificial mineral manures did so to the amount of less than a bushel of dressed corn, and only 35 lbs. of straw. On the other hand, mineral manure and only 65 lbs. of sulphate of ammonia per acre, gave nearly as much produce as the farmyard manure; whilst one experiment, in which 80 lbs. of sulphate of ammonia were employed with mixed mineral manure, gave the highest produce obtained in that year, and nearly 4 bushels of corn, and 300 lbs. of straw, more than was yielded by the farmyard manure.

The obvious conclusion was, that, by the ordinary course of cropping to which the land had been subject, the soil had become deficient in available nitrogen relatively to the available supply of mineral constituents required by the wheat-plant.

Second Season, 1844-5.

November, 1844, was comparatively warm, with a good deal of rain. December was unusually severe throughout. January (1845) was very wet and mild. February and the greater part of March were extremely cold, the thermometer on several occasions showing lower temperatures than had been observed for many years, and at intervals a good deal of snow fell. April was cold, but, upon the whole, dry; and May was cold, wet, and unseasonable. In June not much rain fell, and the weather was pretty warm throughout; but July and August were generally both cold and wet. September, too, was cold throughout, with an excess of rain during the latter half of the month. In June, the dew-point was considerably above, in July about, and in August and September somewhat below the average; but, in each of these months, the degree of humidity of the air was notably above the average.

The wheat-crop of 1845 was generally deficient in bulk, yield, and quality. It was in this season that the potato disease first appeared to any extent.

The following is a summary of the results obtained in the experimental field:—

TABLE II.—SUMMARY of the Results of the SECOND SEASON, 1844-5.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	23	0¾	56·5	1441	2712
14 tons Farmyard Manure (Plot 2)	32	0	56·8	1967	3915
2 cwts. Carbonate of Ammonia (top-dressed in solution), Plot 5[2]	26	3¾	57·3	1732	3599
3 cwts. Ammonia-salts (equal parts Sulphate and Muriate); mean of 2 plots (9 and 10) ..	32	2½	57·3	2056	4162
2 cwts. Ammonia-salts (equal parts Sulphate and Muriate) and Superphosphate of Lime (plot 18)	33	0½	56·5	2048	3819
2 cwts. Sulphate of Ammonia, 5 cwts. Rape-cake, and Mineral Manure; mean of 3 experiments (plots 1, 11, and 12)	28	2¼	55·3	1804	3979

Owing to the very unfavourable winter of 1844-5, severe frost

alternating with a great deal of rain, it was impossible to pre the land and sow the manures and seed in the experimental until March, 1845; and, as the above statement shows, the p from seed-time to harvest was, with the exception of June, al uniformly cold, wet, and unseasonable. Further, as already ferred to, mineral manures were applied on very few, and monia-salts, or rape-cake, on most of the plots.

As above stated, the wheat-crop of the country was rep to be generally deficient in quantity as well as quality; b the experimental field, although the quality, as indicated b weight per bushel, and the proportion of corn to straw, was the bulk and weight of total produce were above the avera the 20 years under comparable conditions of manuring. In both without manure, and with farmyard manure, the produ corn was about 1¼ time, and that of straw about 2½ tim much as in the reputedly very much more favourable seas 1844.

The produce without manure being 23¼ bushels, and th farmyard manure 32 bushels, 3 cwts. of ammonia-salts per (succeeding a mineral manure in the previous season) gav bushels of corn and 4162 lbs. of straw, or more both of corn straw than the 14 tons of farmyard manure; whilst only 2 of ammonia-salts per acre, but used in conjunction with mi manure (plot 18), gave even rather more corn, and not less straw.

It is unfortunate that mineral manure was in no case alone in this season. But the effects of ammonia-salts, as i preceding season, are very striking. It is also seen, by a parison of the result of 2 cwts. of ammonia-salts with mi manure, with that of 3 cwts. without it (though succe mineral manure in the previous season), that the mineral stituents supplied, though so inactive when used alone i preceding year, had a very marked effect when a sufficient an of ammonia was at the same time provided within the soil. influence of the mineral manure was, moreover, very mu increase the tendency to the production of corn rather th straw.

Third Season, 1845-6.

Throughout the winter of 1845-6 the temperature was gen above, and sometimes considerably above, the average. Ir cember and January there was a great deal of rain, b November and February less than the average. The first p March, too, was considerably warmer than usual, with little It then became colder, and towards the end of the month was frost and snow. The beginning and end of April

rather cold, but otherwise the month was mild, with a good deal of rain. May was very fine, the temperature being much above, and the rain-fall much under the average. June was very unusually hot and dry until towards the end of the month, when the weather broke up with a thunder-storm. July was variable, but, upon the whole, seasonable, with a good deal of very hot weather, and but little rain. In the beginning of August there was great heat with heavy thunder-storms, and excessive amount of rain, the rest of the month being favourable. September was also generally warm and favourable, but with a fair amount of rain towards the end of the month. The dew-point generally ranged high throughout June, July, August, and September; but, with the prevailing high temperatures, the degree of humidity of the air was, in June and July somewhat below, and in August and September not much above the average.

Upon the whole, the winter, spring, and summer of 1845-6 were unusually warm, the summer dry, and the harvest-time generally favourable.

With these qualities of season, the wheat-crop of the country was estimated to be below the average in amount, but to be of very good quality.

In the experimental field mineral manures were employed more generally, in greater variety, and in greater abundance, than in the preceding season. Ammonia-salts, or rape-cake, or both, were also used on many of the plots. Among the mineral manures, the ashes of wheat-straw, and Liebig's wheat-manure, were repectively employed alone, with ammonia-salts, with rape-cake, and with both ammonia-salts and rape-cake. Upon the whole, there was more of uniform plan in the selection and arrangement of the manures in this season than formerly; and, as already referred to, the double-land plots were now, and henceforth, subdivided; though, especially in the later years of the experiments, the two lands designated *a* and *b* respectively, generally served as duplicates with the same manure. Passing over all details, Table III. (p. 108) is a summary of the results obtained in this season.

The experimental wheat-crop of 1846 was by no means so bulky as that of 1845; but (as also over a large area of the country) the quality was very much above the average, both the proportion of corn to straw, and the weight per bushel of dressed corn, being very high.

Taking the unmanured produce of dressed corn as the standard for comparison, the farmyard manure gave an increase of 9¼ bushels; mineral manure alone (though succeeding ammonia-salts or rape-cake, or both, in the preceding season), of under 3 bushels; 2 cwts. of sulphate of ammonia alone (after ammonia-salts in the preceding year, and mineral manure

TABLE III.—SUMMARY of the Results of the THIRD SEASON, 1845-6.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Weight per Bushel.	Total Corn.	St a Ch
	Bush.	Pks.	lbs.	lbs.	1
Unmanured (Plot 3)	17	3¾	63·8	1207	1!
14 tons Farmyard Manure (Plot 2)	27	0¾	63·0	1826	24
Mixed Mineral Manures; mean of 4 experiments (Plots 1, $5a^1$, 6a, and 18b)	20	3	63·0	1422	1:
2 cwts. Sulphate of Ammonia alone (Plot 10a)	27	1¼	63·6	1850	2:
2 cwts. Ammonia-salts (equal parts Sulphate and Muriate), and Mixed Mineral Manure; mean of 9 experiments (Plots $5a^2$, 6b, 8b, 11b, 12b, 13b, 14b, 17b, and 18a)	29	0¼	63·2	1965	2(
4 cwts. Rape-cake, and Mixed Mineral Manure; mean of 8 experiments (Plots $5b^1$, 7a, 8a, 11a, 12a, 13a, 14a, and 16a)	23	2¼	63·2	1603	2(
2 cwts. Ammonia-salts (equal parts Sulphate and Muriate), 4 cwts. Rape-cake, and Mixed Mineral Manure; mean of 4 experiments (Plots $5b^2$, 7b, 16b, and 17a)	31	2	63·1	2125	3(

in the year before that), 9½ bushels ; 2 cwts. of ammonia-salts mineral manure, rather over 11 bushels ; 4 cwts. rape-cake mixed mineral manure, 5¾ bushels ; and 2 cwts. ammonia-s 4 cwts. rape-cake, and mixed mineral manure, 13½ bushels.

Thus, under the influence of this hot and dry summer, ammonia-salts alone gave rather more corn, and not much straw, and the ammonia-salts and mineral manure together n of both corn and straw, than the farmyard manure; whilst neral manures alone gave very much less produce than ammo salts alone. Here again, then, in a very different season, an the third of the growth of wheat on the same land, the inefficie of mineral manures alone, and the marked effect of nitroge manures, are very striking.

Fourth Season, 1846-7.

Until the end of November, 1846, the season was mild avourable. December, January, February, and consider art of March, were extremely cold, with intense frosts, and m og, and, towards the end of February, deep snow ; January however, less rigorous than the other months. The remainde March, the whole of April, and the early part of May were unusually cold, with but little rain until towards the end of A fter which there was a good deal. The latter part of May he beginning of June were fine, with a good deal of high t erature ; but during the latter part of June more than the u mount of rain fell and the temperature was also below

average. July was, upon the whole, fine, sometimes excessively hot, with little distributed rain, but a good deal in a heavy thunderstorm towards the end of the month. In August, again, not much rain fell, but it was distributed over the whole month. September was showery, windy, and generally of rather low temperature, but still, upon the whole, favourable. In June, both dew-point and degree of humidity of the air were rather below the average; in July the dew-point was above, but the degree of humidity below the average; in August, both dew-point and degree of humidity were considerably above the average; and in September the dew-point was low, but with the prevailing low temperatures the degree of humidity was rather high.

Both the yield per acre, and the quality of the grain, of the harvest of 1847, were reported to be generally above the average.

In the experimental field mineral manures were in no case employed alone in this season; neither potass, soda, nor magnesia was used. Superphosphate of lime was applied in smaller quantity than in the preceding year, but on nearly the same plots; ammonia-salts in rather larger quantity; and rape-cake not at all; but rice, as a means of supplying decomposing organic matter containing much less nitrogen than rape-cake, was applied in a few instances in large quantity per acre. The following is a summary of the most characteristic results:—

TABLE IV.—SUMMARY of the Results of the FOURTH SEASON, 1846-7.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. — Dressed Corn. — Quantity.		Dressed Corn. — Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	16	3½	61·0	1123	1902
14 tons Farmyard Manure (Plot 2)	29	3¾	62·3	1981	3628
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate); mean of 8 experiments (Plots 6a, 6b, 7a, 7b, 9a², 9b, 10a, and 10b)	25	3¼	61·6	1711	2921
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Superphosphate of Lime; mean of 14 experiments (Plots 5a, 11a, 11b, 12a, 12b, 13a, 13b, 14a, 14b, 16a, 16b, 17a, 18a, and 18b	29	3¼	62·3	1991	3502
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Superphosphate of Lime; mean of 2 experiments (Plots 8b and 17b) ..	33	0½	61·9	2167	3991
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Superphosphate of Lime, and 500 lbs. Rice; mean of 2 experiments (Plots 5b and 8a)	32	2	61·7	2124	3702
10 cwts. of Rice alone (Plot 9a¹)	22	3	..	1351	2506

Although the wheat-crop of 1847 was reported to be generally above the average, both as to yield per acre and quality, there was here, except in the case of the farmyard manure, not quite so much corn for a given amount of manure applied, nor was the weight per bushel so high, as in the preceding year. The amount of straw was, on the other hand, much greater; though, neither was it, nor that of the corn, equal to the average of the years of experiment. The quality of the grain, as indicated by the weight per bushel, was, however, considerably above the average.

By farmyard manure there was an increase over the unmanured produce of 13 bushels of corn, and 1726 lbs. of straw; and there was very nearly the same amount by 300 lbs. of ammonia-salts together with superphosphate of lime. Without the superphosphate of lime the ammonia-salts show a deficiency of nearly 4 bushels of dressed corn, and of 581 lbs. of straw. 400 lbs. of ammonia-salts with superphosphate of lime gave 33 bushels of dressed corn per acre, or an increase over the unmanured produce of about 16 bushels, and over that by farmyard manure of rather over 3 bushels of corn and of 363 lbs. of straw. By the substitution of 100 lbs. of ammonia-salts by 500 lbs. of rice, the quantity of both corn and straw was somewhat reduced; and by the use of 1 ton of rice alone, the total increase obtained was little more than one-third the weight of the manure employed.

Here again, then, in the fourth season, ammonia-salts alone gave a very considerable amount of increase, and when used in conjunction with superphosphate of lime the largest produce of the season was obtained.

Fifth Season, 1847-8.

November, December, January, and February of the winter of 1847-8 were, upon the whole, fine and mild, though there was some excessively cold weather, with dry piercing winds, sharp frosts, and snow towards the end of January and beginning of February, and during the remainder of the latter month a great deal of rain, but with comparatively high temperature. March and April were very wet and cold, excepting at the end of the former and the beginning of the latter month, when the weather was finer and warmer. May was genial, with little rain. June and July were unseasonably wet, variable as to temperature, with a good deal of cool, and but little hot weather. August also was unsettled, generally cold, and extremely wet. September was variable with some fine and hot days, but a good deal of wind and low temperature, and towards the end a good deal of rain. In June, July, August, and September, the dew-point ranged rather below the average, more particularly in August

and the degree of humidity of the air was, in June and August slightly above, and in July and September slightly below the average.

With such prevalence of cold and wet weather during the growing and ripening period, the wheat-crop of 1848 was reported to be very deficient both in quantity and quality.

The manuring in the experimental field was generally heavier than in the preceding year. Salts of potass, soda, and magnesia, were again employed on many plots; the amounts of superphosphate of lime, and also of ammonia-salts, were generally larger; and the more highly nitrogenised rape-cake was employed instead of rice. The following is a summary of the results obtained under the above conditions of season and manuring:—

TABLE V.—SUMMARY of the Results of the FIFTH SEASON, 1847–8.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	14	3	57·3	952	1712
14 tons Farmyard Manure (Plot 2)	25	2¾	58·2	1705	3041
Mineral Manure alone; mean of 4 experiments (Plots 0, 8a, 8b, and 9a)	19	0¾	57·7	1243	2121
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Plot 10a	19	1	58·1	1334	2367
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 4 experiments (Plots 9b, 10b, 18a, and 18b) ..	25	3¼	58·7	1703	2959
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 8 experiments (Plots 6a, 6b, 11b, 12b, 13b, 14b, 17a, and 17b)	26	1¼	58·6	1763	3027
500 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure (Plot 5a)	29	3½	59·2	1991	3266
300 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Mineral Manure, and 500 lbs. Rape-cake; mean of 8 experiments (Plots 7a, 7b, 11a, 12a, 13a, 14a, 16a, and 16b)	29	2¾	59·1	1941	3276
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Mineral Manure, and 500 lbs. Rape-cake (Plot 5b)	30	3¼	59·1	1932	3533

With such unfavourable characters of season, the produce in the experimental field agreed with that of the wheat-crop of the country generally in being inferior both in quantity and quality. Although the manuring, both mineral and nitrogenous, was generally heavier than in 1847, or, indeed, than in any preceding season, the amount of produce was considerably less than in either 1847 or 1846, and the weight per bushel of

the grain was also considerably lower. The deficiency was only in amount and quality of grain, but, compared with 1(in quantity of straw also. The defective action of ammonia-(when used without mineral manure was already observable in results of 1847, and it is still more marked in those of 1: Finally, 500 lbs. of ammonia-salts, in combination with min manure containing not only superphosphate of lime, but potass, soda, and magnesia, gave only about the same amou grain in the inferior season of 1848, as 300 lbs. with superp phate of lime in 1847, or even 2 cwts. with mixed mi manure in 1846.

Sixth Season, 1848-9.

The early part of October was fine and mild, but the l part cold, with much heavy rain and wind; the beginni November was very dry and cold, but the remainder o month, and most of December, were mild, with a good of rain; then frost set in, which lasted, with snow and till nearly the middle of January, the remainder of w month was variable as to temperature, but generally very February was, for the most part, fine and mild, until n the end of the month, when it was much colder, very and very windy. March and April were cold, and a great of rain fell in the latter month. May was also very wet, bu and warm at the close. June was fine and dry, but rather July dry and hot until towards the end, when there were se heavy thunder-storms. August also was fine, with the exce of some thunder-storms. September variable, with a good of rain in the early part. In June, July, August, and Septer the dew-point was below the average; and the degree of hum of the air was, in June slightly, but in July, August, September, considerably below the average.

Upon the whole, then, the winter and spring of 1848-9 mild, with a good deal of rain, and the summer and aut with some exceptions, seasonable and warm. The wheat-cr the season was reported to be very abundant.

The manuring for the sixth season was much the same a the fifth; the chief alteration being the substitution of 40(of ammonia-salts in most cases where 300 lbs. of ammonia and 500 lbs. of rape-cake had been used in the preceding ye

With generally favourable weather throughout, and dry warm weather before and about the time of harvest, the resi the experimental field, as in the country generally, was a w crop above the average, both as to quantity and quality. amount of produce for a given amount of manure was more in 1848, 1847, or even 1846. The weight per bushel of dr

corn was rather higher than in any other year of the experiments; and the proportion of corn to straw was much above the average, being about the same as in 1846 and 1857, the years of highest yield of corn in proportion to straw throughout the 20 years, 1844 excepted, when it was unusually high, but when, in these experiments, the total amount of produce was very small.

TABLE VI.—SUMMARY of the Results of the SIXTH SEASON, 1848-9.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	19	1	61·4	1229	1614
14 tons Farmyard Manure (Plot 2)	31	0	63·8	2068	3029
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Plot 10*a*	32	2¼	62·3	2141	2851
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 18 experiments (Plots 6*a*, 6*b*, 7*a*, 7*b*, 11*a*, 11*b*, 12*a*, 12*b*, 13*a*, 13*b*, 14*a*, 14*b*, 16*a*, 16*b*, 17*a*, 17*b*, 18*a*, and 18*b*)	34	3	63·8	2318	3393
500 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure (Plot 5*a*)	37	1½	63·1	2446	3589
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Mineral Manure, and 500 lbs. Rape-cake (Plot 5*b*)	39	3½	63·4	2651	3824

The season of 1849 seems to have been particularly favourable for the action of nitrogenous manures; there being comparatively little deficiency where the ammonia-salts were used alone, as compared with the result with the same amount in conjunction with mineral manure; and the excessive amounts of ammonia gave proportionally larger amounts of increase than in most of the other seasons.

Seventh Season, 1849-50.

The autumn of 1849 was generally favourable for getting in the seed. In the early part of December, and the latter part of January (1850) there was a good deal of rain, and, intermediately, pretty continued frost. February was fine and mild; March fine, but very cold; April very fine and seasonable until the last week, when it was much colder; and May cold and wet in the early part, but seasonable afterwards. June, July, August, and September, were almost throughout unseasonably cold; and there were occasional heavy rains in June and July, but during August, and the greater part of September, but little rain fell.

In June, August, and September, the dew-point was rath below, but in July rather above the average; and the degree humidity of the air was in June considerably below, in July a August somewhat above, and in September somewhat below t average.

The harvest was late, the wheat-crops much laid, and the yie per acre was estimated to be below the average.

With few exceptions, which it is not necessary to notice he the manures applied in the experimental field were much t same as in the two preceding seasons. The following is a su mary of the results:—

TABLE VII.—SUMMARY of the Results of the SEVENTH SEASON, 1849-5(

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Str a Ch
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	l
Unmanured (Plot 3)	15	3¾	60·6	1002	17
14 tons Farmyard Manure (Plot 2)	28	2	61·9	1861	32
Mineral Manure alone (Plot 0)	19	1½	60·8	1220	2(
400 lbs. Ammonia-salts alone (equal parts Sulphate and Muriate) Plot 10*a*	26	3¾	60·2	1721	3(
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 16 experiments (Plots 6*a*, 6*b*, 11*a*, 11*b*, 12*a*, 12*b*, 13*a*, 13*b*, 14*a*, 14*b*, 16*a*, 16*b*, 17*a*, 17*b*, 18*a*, and 18*b*)	30	3¼	61·0	1991	4(
500 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 2 experiments (Plots 5*a* and 5*b*)	30	1¼	60·4	1996	44
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Mineral Manure, and 500 lbs. Rape-cake; mean of 2 experiments (Plots 7*a* and 7*b*)	32	0½	61·1	2123	4[illegible]

Under the influence of the cold and unsettled summer of 1{ he produce of corn in the experimental field was several busl ess than under parallel conditions of manuring in 1849, but t f straw was considerably more; and the weight per bushel lressed corn, though much lower than in 1849 and several ot years, was above the average of the 20 years.

The proportion of increase when ammonia-salts were u ione was even greater than in some of the earlier years; in f nly 2 bushels per acre less than where the same amount of uonia-salts was used in conjunction with mineral manure; quantity of straw was, however, proportionally much gre vhere the mineral manure was also employed. Again, un

the result of 1849, 500 lbs. of ammonia-salts (with mineral manure) gave scarcely as much grain as 400 lbs., but considerably more straw than the latter.

Upon the whole, the experimental crop was probably not so far inferior to the average as the wheat-crop of the country was generally estimated to be; but under the influence of the cold and unsettled summer the tendency of high manuring was to give a deficient amount of grain, and an excessive proportion of straw.

Eighth Season, 1850-1.

October (1850) was very fine, but very cold; November, December, and January (1851) were, upon the whole, fine and mild. February was generally fine, but cold. March was, for the most part, wet, cold, and windy. In April there was a good deal of rain, and the temperatures were low during the first half of the month. May and the greater part of June were dry, but unseasonably cold; July was also colder than usual, and during the month a good deal of rain fell heavily at intervals. August was very fine until nearly the end of the month, when heavy rain fell. September was fine throughout, but with rather low temperatures. In June, July, August, and September, the dew-point ranged low, but in August less, and in September more so, than in the other months; the degree of humidity of the air also was, in each of these months, below the average—less so in June and July than in August, and considerably less in August than in September.

Upon the whole, therefore, the winter was mild, the spring and a great part of the summer were cold and unsettled, but the ripening and harvest periods, though cold, were, upon the whole, fine and dry. The wheat-crop of the country was considered to be decidedly above that of 1850, both in quantity and quality, but inferior to that of 1849, especially in quantity.

In the experimental field the allotment of manures was much the same as in several preceding seasons; the chief alteration being that in a few cases the amounts of ammonia-salts and of rape-cake were increased. In one instance in this season (Plot 16*a*), as also in the two succeeding seasons, common salt was employed, for the results of which the reader is referred to the Appendix Tables VIII., IX., X., and XI., pp. 160-5.

Under the influence of the prevailing cold and ungenial growing period of 1851, the amounts of gross produce, corn and straw together, were, under like conditions of manuring, not very different from those of 1850 and 1849; but the proportion of corn to straw was somewhat higher than in 1850, though in a greater degree lower than in 1849. Indeed, the results in the experi-

TABLE VIII.—SUMMARY of the Results of the EIGHTH SEASON, 1850–51.

MANURES. (Quantities per Acre.)	Produce per Acre, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	15	3¼	61·1	1083	1627
14 tons Farmyard Manure (Plot 2)	29	2¼	63·6	2049	3094
Mineral Manure alone; mean of 2 experiments (Plots 0 and 1)	18	2½	61·8	1274	1854
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Plot 10*a*	28	3¼	61·9	1966	3070
200 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure (Plot 8*b*)	27	2¼	62·6	1863	2830
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure: mean of 12 experiments (Plots 6*a*, 6*b*, 11*a*, 11*b*, 12*a*, 12*b*, 13*a*, 13*b*, 14*a*, 14*b*, 17*a*, and 17*b*)	31	2¾	62·8	2155	3511
600 lbs. Ammonia-salts (equal parts Sulphate and Muriate), and Mineral Manure; mean of 4 experiments (Plots 5*a*, 5*b*, 16*a*, and 16*b*) ..	36	3½	63·4	2521	4248
400 lbs. Ammonia-salts (equal parts Sulphate and Muriate), Mineral Manure, and 1000 lbs. Rape-cake; mean of 2 experiments (Plots 7*a* and 7*b*)	37	0¼	63·0	2528	4444

mental field agreed with the estimates of the wheat-crop over th country generally, in showing the order of the highest grain yielding quality of the three seasons to have been 1849, 1851 1850, and that of the highest straw-producing character to hav been, on the other hand, 1851, 1850, and 1849. The amount c produce, both corn and straw, was, however, below the averag of the 20 years of experiment; though the proportion of corn t straw was fully equal, and the weight per bushel of the grai considerably above the average, these favourable characters bein doubtless due to the prevailing dry weather during the maturin and harvest periods.

The season was, upon the whole, pretty favourable for th action of nitrogenous manures, the difference between the produc by ammonia-salts when used alone, and in conjunction with m neral manures, being less than frequently; whilst 600 lbs. ammonia-salts (with mineral manure), though an excessiv amount for the average of seasons, gave not very far short of th same amount of increase of corn for a given quantity of ammoni employed as when only 400 lbs. were used. Both these amount however, gave proportionally much less increase than onl 200 lbs.

As already explained, and indicated by the few comments made on the results, the arrangement of the manures of the first eight seasons was determined on each year with reference to certain individual points, regard being at the same time paid to the previous manuring and produce of the respective plots, and much more uniformity observed from year to year in the later years. From this time forward, it was sought to bring the whole of the plots still more strictly into comparison one with another, each year, and through a series of years, in order to trace, by the conjoint aid of the field-results and analysis, the relative excess, or, deficiency, of the available supply of the different constituents required by the crop, year by year, and through a long course of years. To this end, in the ninth and eleven succeeding years, the manure has been, with a few special exceptions, the same from year to year on the same plot. The only exceptions requiring notice here are, that the manures of Plots 17 and 18 are annually transposed, and that in the sixteenth and succeeding seasons some of the mineral manures were reduced in quantity per acre on all the plots where they had been previously applied.

Appendix Table IX., p. 162, shows, in a tabular form, the manure applied to each plot, in each of the last 12 years of the experiments; but it will be well to give a more explanatory statement of the description and arrangement of the manures in this place. In doing so the plots will not be enumerated in the same order as in the field, and in the Appendix Tables, but in such as will best indicate the points of comparison which it was sought to establish by the arrangement adopted.

The plan, description, and quantities per acre per annum, for the 12 years (1852-63), were as follows:—

Plot 2.—14 tons farmyard manure (also for the eight preceding years).

Plot 3.—Unmanured (also for the eight preceding years).

Plot 20.—Unmanured (also for five preceding years), duplicate at the other side of the field.

Plot 4.—Unmanured (sulphate of ammonia, and bone-ash acted upon by hydrochloric acid, for seven preceding years).

Plot 0.—Superphosphate of lime alone; composed of 600 lbs. bone-ash and 450 lbs. sulphuric acid, sp: gr: 1·7 (also for three preceding years).

Plot 1.—Mixed alkalies; composed of 600 lbs. sulphate of potass, 400 lbs. sulphate of soda, and 200 lbs. sulphate of magnesia (also for three preceding seasons); reduced to 400, 200, and 200 lbs. respectively, in the sixteenth and succeeding seasons.

Plots 5 (*a* and *b*).—Mixed mineral manure; composed of—

300 lbs. sulphate of potass.
200 lbs. sulphate of soda.
100 lbs. sulphate of magnesia.
200 lbs. bone-ash . . . . } superphosphate of lime.
150 lbs. sulphuric acid, sp: gr. 1·7 }

In the sixteenth and succeeding seasons the sulphate of pota was reduced to 200 lbs., and the sulphate of soda to 100 lbs.

Plot 21.—Mixed mineral manure, as Plots 5, and 100 lbs. muriate ammonia.

Plot 22.—Mixed mineral manure, as Plots 5, and 100 lbs. sulphate ammonia.

Plots 6 (*a* and *b*).—Mixed mineral manure, as Plots 5, and 100 lbs. ea sulphate and muriate of ammonia.

Plots 7 (*a* and *b*).—Mixed mineral manure, as Plots 5, and 200 lbs. ea sulphate and muriate of ammonia.

Plots 8 (*a* and *b*).—Mixed mineral manure, as Plots 5, and 300 lbs. ea sulphate and muriate of ammonia.

Plots 16 (*a* and *b*).—Mixed mineral manure, as Plots 5, and 400 l each, sulphate and muriate of ammonia.

Plots 17 (*a* and *b*).—200 lbs. each, sulphate and muriate of ammo in the ninth and every alternate season; and mixed mineral manu as Plots 5, in every intermediate season.

Plots 18 (*a* and *b*.)—Mixed mineral manure, as Plots 5, in the ni and every alternate season; and 200 lbs. each, sulphate and muri of ammonia in every intermediate season.

Plot 10 *a*.—200 lbs. each, sulphate and muriate of ammonia (ammoi salt alone also in the seven preceding seasons, succeeding silic of potass and superphosphate of lime in the first season).

Plot 10 *b*.—200 lbs. each, sulphate and muriate of ammonia (the sa in the eighth season, mixed mineral manure in the seventh, ammoi salts in the sixth, ammonia-salts and mixed mineral manure in fifth, ammonia-salts in the fourth, unmanured in the third, ammoi salts in the second, and silicate of potass and superphosphate lime in the first season).

Plots 11 (*a* and *b*).—200 lbs. each, sulphate and muriate of ammo and superphosphate of lime as Plots 5.

Plots 12 (*a* and *b*).—200 lbs. each, sulphate and muriate of ammo superphosphate of lime as Plots 5, and 550 lbs. sulphate of s (reduced to 366 lbs. in the sixteenth and subsequent seasons).

Plots 13 (*a* and *b*).—200 lbs. each, sulphate and muriate of ammo superphosphate of lime as Plots 5, and 300 lbs. sulphate of po (reduced to 200 lbs. in the sixteenth and subsequent seasons).

Plots 14 (*a* and *b*).—200 lbs. each, sulphate and muriate of ammo superphosphate of lime as Plots 5, and 420 lbs. sulphate of magn (reduced to 280 lbs. in the sixteenth and subsequent seasons).

Plot 9 *a*.—550 lbs. nitrate of soda, and mixed mineral manure Plots 5 (only 475 lbs. nitrate in the ninth, and 275 lbs. in tenth and eleventh seasons, and no mineral manure in the ni tenth, and eleventh seasons, commencing only in the twelfth).

Plot 9 *b*.—550 lbs. nitrate of soda alone (only 475 lbs. in the ni season).

Plot 15 *a*.—Mixed mineral manure, as Plots 5 (but with 200 hydrochloric instead of 150 lbs. sulphuric acid), and 400 sulphate of ammonia.

Plot 15 *b*.—Mixed mineral manure, as Plots 5 (but with 200

hydrochloric instead of 150 lbs. sulphuric acid), 300 lbs. sulphate of ammonia, and 500 lbs. rape-cake.

Plot 19.—200 lbs. bone-ash, 200 lbs. hydrochloric acid, 300 lbs. sulphate of ammonia, and 500 lbs. rape-cake.

The sulphates of potass, soda, and ammonia, the muriate of ammonia, and the nitrate of soda, were the ordinary articles of commerce passing under those names; the sulphate of magnesia was Epsom salts. In the following Tables, and discussion, the term "ammonia-salts" will, for brevity, be employed to designate the equal mixture of the sulphate and muriate of ammonia.

The only exception to the above statement of manuring for each of the last 12 years is, that in the first two of them, namely, 1852 and 1853 (and also in the immediately preceding year, 1851), chloride of sodium, or common salt, at the rate of 3 cwts. per acre per annum, was applied to Plot 16 *a*, in addition to the manures enumerated above for that plot.

In the few comments which now follow on the produce of each separate season, with the view of showing the varying effects of one and the same manure according to season, but little reference will be made either to the varying condition of the different plots due to the varying character of the manuring during the preceding eight years, or to that attributable to use of the same manure year after year on the same land; leaving the important question of the limit, or degree, of the effect of accumulation or exhaustion from previous manuring and cropping on the produce of succeeding seasons, for entirely separate consideration further on.

Ninth Season, 1851-52.

October (1851) was, for the most part, fine and mild; November fine, but very cold; December less severe; January and February (1852) mild, with a good deal of rain; March dry and clear, but cold and frosty; April dry, with some hot sun, but a good deal of cold east wind; May variable, but with a good deal of cold east wind; June very wet and cold; July very hot, with several heavy thunderstorms; August, fine at the beginning, very wet in the middle, and fine and hot at the end; September, fine until the 6th, when there was a heavy thunderstorm, with a good deal of rain, the rest of the month being variable, with prevailing low temperatures, but upon the whole not unfavourable. In June the dew-point was below, but the degree of humidity of the air slightly above the average; in July the dew-point was above, but the degree of humidity considerably below the average; and in August and September both dew-point and degree of humidity were notably below the average.

The winter was, therefore, upon the whole, favourable; the

spring dry, cold, and backward; the early summer rainy cold, and the maturing period variable, with a good deal of weather, and some heavy storms.

The wheat-crop was reported to be generally not deficien bulk, but in many districts much blighted, mildewed, and gr the result being a yield considerably below the average.

In the following Table is given such a selection of the ex mental results as will best illustrate the influence of the se on the productive effects of the different descriptions of ma employed; and all future summaries given to illustrate characters of the seasons will relate to the produce of the plots.

TABLE IX.—SUMMARY of the Results of the NINTH SEASON, 1851–2

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.			
	Dressed Corn.			Total Corn.
	Quantity.		Weight per Bushel.	
	Bush.	Pks.	lbs.	lbs.
Unmanured (Plot 3)	13	3¼	56·6	860
14 tons Farmyard Manure (Plot 2)	27	2¼	58·2	1716
400 lbs. Ammonia-salts alone (Plot 10*a*)	21	3¾	55·9	1320
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	16	3¾	57·4	1052
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	19	2	56·4	1177
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	20	3¼	57·5	1294
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	26	3	55·9	1629
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	27	2	55·9	1675
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	28	1¾	54·7	1747

The unmanured produce of grain was the lowest yet obta and below the average of the 20 years. The effect of a g amount of ammonia-salts, whether alone or in conjunction mineral manure, was very much below the average, especial far as the production of grain was concerned, and where quantities were used. Even the produce of straw was siderably below the average obtained under like conditio manuring; but much more so where the small than wher large amounts of ammonia-salts were employed. The w per bushel of dressed corn was also throughout very low, especially so in the case of the heavier crops.

Upon the whole, the produce of the experimental field wa worst yet obtained.

Tenth Season, 1852-3.

October and November (1852) were very wet, and, the latter month particularly, very unseasonably warm; December and the first half of January (1853) were also unseasonably mild with a good deal of rain; the rest of January, February, and March, were very cold with a good deal of east and north-east wind, and some snow; April and May were for the most part cold and wet, with the exception of a short period in the middle of each month; June variable, with a good deal of rain and cold wind; the greater part of July was excessively wet with low temperatures, but the end of the month and the beginning of August were fine; the remainder of August and September were dull, unsettled, wet, and cold. Both the dew-point and degree of humidity of the air were generally, and especially the latter, sometimes considerably below the average in June, July, August, and September.

In consequence of the very unfavourable seed-time the breadth of land under wheat was much reduced, and the crop of 1853 was reported to be far inferior to that of any season for many years past.

In the experimental field it was found impossible to work the land, and sow the manures and seed, until February and March, 1853. The following is an abstract of the results obtained from this spring-sown crop:—

TABLE X.—SUMMARY of the Results of the TENTH SEASON, 1852-3.

MANURES. (Quantities per Acre.)	Produce per Acre, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	5	3¼	45·9	359	1413
14 tons Farmyard Manure (Plot 2)	19	0¼	51·1	1120	3372
400 lbs. Ammonia-salts alone (Plot 10*a*)	9	3¾	48·6	642	2049
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	10	0¾	48·6	599	2040
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	11	2¼	49·8	673	2021
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	18	0¼	51·5	1030	2788
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	23	2¾	52·0	1363	3738
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	23	1¾	51·8	1386	3947
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	25	0½	52·3	1517	4962

Bad as was the result obtained in the experimental field in 1852, it was very much worse in 1853; indeed, it was, in the latter year, the worst in almost every particular throughout the whole 20 years of the experiments.

Without manure, with farmyard manure, and with the different artificial manures, the produce of grain was considerably less, and the quality worse, than in any other year. The season was very unfavourable for the action of ammonia-salts, especially so far as the production of grain was concerned; though, as in 1852, there was a considerable growth of straw under the influence of the heavier ammoniacal dressings. The weight per bushel of dressed corn was extraordinarily low; being in several instances below, and in none much above 50 lbs.

Eleventh Season, 1853-4.

The latter end of October, and November (1853), were generally favourable; December, and January and February (1854) were upon the whole unusually severe, with a good deal of snow, excepting that the middle and latter part of January, and the end of February, were comparatively mild and fine; March and the greater part of April were very fine, but at the end of the latter month there was unusually severe frost for the period, and a good deal of cold north wind; May was variable, generally cold, and backward, with a good deal of rain; June was generally fine, but cold; the first half of July was also cold with a moderate amount of rain, then came a week or two of fine hot weather, which was succeeded by thunder-storms and heavy rain; the beginning of August was wet, the middle fine though not warm, but the end dry and hot; September was almost throughout fine and favourable for getting in the crops, with high day, though low night temperatures. In June, July, August, and September, the dew-point was below the average; and the degree of humidity of the air was, in June above, in July about, and in August and September below the average.

Upon the whole, then, the period of seed time had been favourable; the winter was unusually severe; the early spring favourable, but succeeded by cold and unseasonable weather until the middle of July, from which time, however, until harvest, the period, though changeable, embraced some fine maturing and harvest weather.

With these characteristics, by no means continuously favourable, the harvest of 1854, though late, was, particularly so far as wheat was concerned, one of the largest yield per acre for many years past.

As the following summary will show, the produce of the experimental field quite bore out this character.

TABLE XI.—SUMMARY of the Results of the ELEVENTH SEASON, 1853–4.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	21	0¼	60·6	1359	2137
14 tons Farmyard Manure (Plot 2)	41	0⅛	62·5	2675	4450
400 lbs. Ammonia-salts alone (Plot 10*a*)	34	1½	60·5	2211	3597
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	24	0⅝	61·3	1555	2512
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	31	3⅝	61·1	2012	3390
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	34	0½	61·8	2213	3950
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	45	2	61·8	29 7	5550
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	48	2¼	61·6	3137	6126
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	49	3½	61·7	3262	6669

Thus, the experimental wheat-crop of 1854, the eleventh in succession on the same land, was by far the best hitherto obtained, and nearly the best throughout the 20 years. The weight of grain per acre was generally more than double that of the bad season of 1853 under parallel conditions of manuring: it was about equal to that of 1857; and not far short of that of the extraordinary season just past, 1863. In weight of straw, indeed, the crop of 1854 far exceeded that of 1857, and nearly approached that of 1863. The weight per bushel of dressed corn was also considerably above the average, above that of 1857, and little short of that of 1863. The crop was, then, upon the whole, far above the average in quantity both of corn and straw, and in quality of the former.

The produce of corn per acre by ammonia-salts alone, although it was the tenth year of their application on the same plot without mineral manure, was greater than in any preceding year; and, as will be seen further on, the increase obtained for a given amount of ammonia supplied, was, throughout the plots, considerably more than in the average of seasons. And, notwithstanding the season was so favourable for the action of nitrogenous manures, it was even better than the rival years of 1857 and 1863 for the development of the unmanured, and only mineral-manured crops.

Upon the whole, then, consistently with the character of the crop over the country generally, the experimental wheat-crop of 1854 was as remarkable for superiority in almost every particular, both of quantity and quality, as that of 1853 had been in the opposite direction.

Twelfth Season, 1854-5.

The autumn of 1854 was, upon the whole, fine and season able; December, and the first half of January (1855), were fin and generally mild. Then came severe frost and deep snow, an the frost, with occasional snow, rain, and thaw, lasted with more o less severity, through February and March. The beginning an end of April were also cold and frosty, and the month was mor or less windy throughout, with dry east winds at the close. May and June were for the most part very cold and dry, with the exception of a short interval in the middle of that period, and the end of June, which was very hot; July was very variable with many fine hot days, but with severe thunder-storms, and, upon th whole, a great excess of rain. The beginning of August wa also wet, but the remainder of the month was fine; Septembe also was fine, but cool. In June, August, and September, both the dew-point and the degree of humidity of the atmospher ranged low, but in July both were somewhat in excess of th average.

Thus, the latter part of the winter, and the early spring, wer extremely severe; the remainder of the spring and the earl summer cold and dry; July was very variable, with a great dea of rain, and a rather humid atmosphere; but the maturin and harvest periods were more favourable. With these cha racters of season, the wheat-crop of 1855 was reported to b much less abundant than that of 1854, and the quality ver various.

The experimental crops without manure, by farmyard manur by mineral manure alone, and by mineral manure in conjunctio with the smaller amounts of ammonia-salts, were fully equa to the average of the 12 years in amount both of grain an straw; but those grown under the influence of the heavie ammoniacal dressings were below it in both respects. Th proportion of corn to straw, and the weight per bushel o dressed corn, were both rather over than under the averag of the 12 years. So far as the experimental plots were con cerned, therefore, the season of 1855 was of average produc tiveness with moderate manuring, but it was unfavourable fo high manuring, and for the growth and maturation of larg crops.

The following Table shows the character of the results obtained in the experimental field:—

TABLE XII.—SUMMARY of the Results of the TWELFTH SEASON, 1854–5.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Dressed Corn. Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	17	0	59·2	1072	1787
14 tons Farmyard Manure (Plot 2)	34	2½	62·0	2237	3845
400 lbs. Ammonia-salts alone (Plot 10*a*)	19	3¾	57·1	1285	2512
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	18	1¼	60·0	1150	1820
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	24	2¼	60·5	1543	2438
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	28	0	60·6	1782	2937
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	33	0	59·5	2111	4035
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	31	2	58·8	2031	4090
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	32	3¾	58·2	2108	4763

Thirteenth Season, 1855-6.

In October (1855) a great deal of rain fell; November was generally fine, but cold. The greater part of December was extremely cold, with severe frosts, some snow, and piercing east winds, but the end of the month was warm. January (1856) was very variable, but, upon the whole, mild, as was also February; March dry and cold, with piercing north-east winds; April and May generally cold, and May particularly very wet; June and July changeable as to temperature, with little rain, and frequently very cold nights until nearly the end of the latter month, which, with the beginning of August, was fine and hot; then came heavy thunder-storms with excessive rain, but the end of August, and the first half of September, were fine, after which again succeeded thunder-storms and heavy rain; and the temperature was generally low throughout the month. The mean dew-point and degree of humidity were above or about the average in June, July, and August, and somewhat below it in September.

Thus, the winter was upon the whole mild; the early spring dry and cold, and the remainder cold and wet; the early summer cold and changeable, then came a short interval of fine and hot weather, succeeded, about the ripening period, by very heavy

rains, and prevailing low temperatures. The harvest period was also generally wet and unfavourable, especially in the later districts.

The extent of land under wheat was reported to be considerably above the average, and shortly before harvest the opinion prevailed that the crop would be of more than average productiveness; but owing to the unfavourable harvest weather a considerable proportion of it was badly got in.

The following results were obtained in the experimental field:—

TABLE XIII.—SUMMARY of the Results of the THIRTEENTH SEASON, 1855-6.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	14	2	54·3	892	1558
14 tons Farmyard Manure (Plot 2)	36	1¼	58·6	2277	4317
400 lbs. Ammonia-salts alone (Plot 10*a*)	24	0¾	55·6	1505	2818
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	19	2¼	56·3	1207	2067
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	22	1¾	57·9	1375	2514
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	27	3	58·3	1736	3072
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	36	3¾	57·8	2278	4479
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	39	0	57·0	2454	5136
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	37	3¾	58·6	2438	5498

The quantity of corn per acre, excepting on the unmanured plot, was fully equal to, and that of the straw rather over, the average of the last 12 of the 20 years. But the crop was unevenly and badly ripened, and the weight per bushel was low. The season was, indeed, not unfavourable to quantity of produce; and so far, to a fair average productiveness under the influence of liberal manuring; but it was unfavourable for the full development and the maturation of the grain.

Fourteenth Season, 1856-7.

The latter part of October and a great portion of November (1856) were fine and seasonable, but the end of November and beginning of December were unusually severe: then came a short period of very mild weather, with a good deal of rain, followed with fine frosty weather; the quarter having been marked by rapid variations of pressure, and extreme changes of temperature

In January (1857) there was a good deal of rain, and the greater part of the month was mild; but it became colder, with frost and snow at the end of the month and the beginning of February. The remainder of February, and March, were very dry, with high barometer, frequent sharp frosty nights, and cold easterly winds. In April there was more rain, but also a good deal of fine though cold weather. May was fine, with a good deal of very warm weather, and but little rain. In June there was a good deal of fine and hot weather, but there were also several thunder-storms, with heavy falls of rain, which were much needed, and thoroughly penetrated the soil. During July the weather was generally fine, and occasionally very hot, with much less than the usual amount of rain. In August there were several thunder-storms with heavy rain, but otherwise the weather was fine and remarkably hot. In the early part of September a good deal of rain fell, but the remainder of the month was fine, and its temperature was pretty uniformly rather above the average. In June, July, and August, though the dew-point ranged somewhat high, the temperature did so in a greater degree, so that the atmosphere was drier than usual.

The winter, excepting in the early part, was therefore generally mild; the spring was less so, with a good deal of dry weather, but with a sufficiency of rain in April. The summer was for the most part hot, with a dry atmosphere, but with genial and plentiful rains in June and the beginning of August; and the harvest period was generally favourable.

TABLE XIV.—SUMMARY of the Results of the FOURTEENTH SEASON, 1856-7.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Dressed Corn. Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	19	3¾	58·3	1236	1577
14 tons Farmyard Manure (Plot 2)	41	0¾	60·4	2587	3323
400 lbs. Ammonia-salts alone (Plot 10*a*)	29	0½	58·0	1816	2392
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	23	3	58·9	1461	1676
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	23	2¼	60·6	1515	1811
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	35	1½	59·9	2202	2757
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	44	3½	60·4	2842	3786
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	48	1	60·7	3094	4374
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	49	1½	60·5	3163	4693

The extent of land under wheat was reported to be less than 1856; but throughout the summer the crop promised extrem well, and after harvest it was estimated to have been unusua productive.

The character of the experimental wheat-crop of 1857 was many points remarkable, and accorded well with the estima formed of the crop over the country generally. The amount of gr produce (corn and straw together) fell considerably short of th of either 1854 or 1863, and did not exceed that of several oth years of much inferior yield of grain; but the proportion of co to straw was unusually high, being only surpassed among tl experimental seasons in 1854, and about equalled in 1846 a 1849, though in neither of these two years was the amount produce per acre at all equal to that of 1857. The quantity straw was, in fact, even below the average, considerably le than the amount of 1854, and still more below that of 186 But the produce of grain, especially under the influence of hi nitrogenous and mineral manuring, was almost identical wi that of 1854, the two seasons standing in this respect second on to 1863; whilst, both without manure, and with mixed mine manure alone, the yield of 1857 even exceeded that of the extr ordinary season just passed (1863).

It was, however, especially where the large amounts of a monia-salts, in conjunction with the mineral manure, we employed, that the tendency to the production of grain rat than of straw was in 1857 so marked, and so much above t average. It is further worthy of remark, that both in 1854, whi was the eleventh season, and in 1857, which was the fourteer season of wheat on the same land, the unmanured produ amounted to about 20 bushels, that by farmyard manure to ab 41 bushels, and that by the heaviest artificial manuring to witl a fraction of 50 bushels per acre.

Fifteenth Season, 1857-8.

October, November, and December (1857) were, upon t whole, very mild, with unusually little rain during the two lat months. January (1858) was also very dry, and during the l fortnight cold, with north wind and sharp frost. February w also generally cold, with a fair amount of rain, and some snow he earlier part, and sharp frosts and easterly winds in the lat part of the month. In March there was little rain, but fro snow, and strong easterly winds in the earlier part of the mon The beginning of April was cold, but most of the remainder fi and even hot, and a moderate amount of rain fell in the beg ning and end of the month; it was also cold in the beginni May, but fine dry and hot towards the end, though wi

heavy showers, and about an average fall of rain during the month. June was upon the whole very fine, dry, and hot, with some heavy thunder-showers, but much less than the average amount of rain. In July there was much more rain, and the weather, though variable, was still upon the whole fine and hot. August and September were very fine, with much less than the average fall of rain. Throughout the quarter ending with September, as also in June, the degree of humidity of the atmosphere ranged notably lower than usual.

There was, therefore, during the winter, spring, and summer of 1857-8, upon the whole, much less than the usual amount of rain; though in February, April, May, and July, there were fair amounts. The air was also generally less humid than usual throughout the summer. The temperature, too, was generally above the average throughout the spring and summer months, whilst June was unusually hot.

Early in the summer the appearance of the wheat-plant was generally that of great luxuriance, promising a bulky crop. Owing to the prevailing dry and warm weather of June the harvest was very early, and the months of August and September were favourable both as to dryness and temperature. The reports indicated a crop fully if not above the average, though by no means equal to the extraordinary one of the immediately preceding season.

The following Table shows the character of the results in the experimental field:—

TABLE XV.—SUMMARY of the Results of the FIFTEENTH SEASON, 1857–8.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	18	0	60·4	1141	1670
14 tons Farmyard Manure (Plot 2)	38	3¼	62·6	2512	3837
400 lbs. Ammonia-salts alone (Plot 10*a*)	22	3½	59·6	1439	2130
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	18	3¾	61·4	1207	1588
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	23	1	61·5	1493	2277
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	28	3½	61·1	1834	2645
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	39	0¼	62·1	2490	4029
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	41	3½	61·8	2678	4667
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	41	3¾	62·1	2710	4805

With the moderate dressings the quantity of gross produce per acre (corn and straw together) was rather below the average of the 12 years; but with the higher manuring it was generally equal, and sometimes above it. The quantity of straw was pretty uniformly below the average under parallel conditions of manuring; but the produce of grain was generally above it, and the more so the higher the manuring. The proportion of corn to straw was, therefore, above the average, and the weight per bushel of dressed corn was also rather high.

Thus, so far as the results in the experimental field are concerned, the season of 1858 was, upon the whole, favourable to high proportion and good quality of grain, under the influence of somewhat liberal manuring. There was, however, a very marked decline in the productiveness of a given amount of ammonia where the excessive amounts of it were employed, indicating a somewhat easily reached limit of the productive capabilities of the season.

Sixteenth Season, 1858-9.

During October, November, and the first half of December (1858) there was very little rain, and during November and the early part of December the weather was very cold. The remainder of December, and January and February (1859) were very fine and mild; March was also upon the whole mild, but with more rain; in April, too, a good deal of rain fell, and the latter part of the month was stormy, wet, and cold. May began with cold dry easterly winds, then came a good deal of rain, succeeded by fine and hot weather. During June there were several heavy thunder-storms, a great deal of rain fell, and the air was more humid than usual, though there was also a deal of fine warm weather. July was upon the whole fine and unusually hot, but there were several severe thunder-storms at the beginning and about the middle of the month. August was rather unsettled, but for the most part warm, with a good deal of rain; September was also unsettled, and cold, with an excessive amount of rain. In July the dew point ranged high, but the temperature relatively higher; and throughout the quarter ending with September the degree of humidity of the air was below the average.

Thus, throughout the winter of 1858-9 there was very little rain, and, with the exception of the early part, the weather was very mild. In April there was a full supply of rain, May a deficiency, June a considerable excess, July a moderate amount, August a full, and September an excessive fall; whilst June and July were considerably above the average temperature—July more especially, bringing the wheat rapidly forward; though,

owing to the heavy rains of June, and the bulk of the crop, it was generally much laid. Still, the prospect before harvest was upon the whole good; but the wet and stormy harvest period, and the length of time the crop was out, led to a good deal of injury, especially to the heavier crops, and when got in the yield was estimated to be below the average.

The following results were obtained in the experimental field:—

TABLE XVI.—SUMMARY of the Results of the SIXTEENTH SEASON, 1858-9.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c. Dressed Corn. Quantity.		Weight per Bushel.	Total Corn.	Straw and Chaff.
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	18	1¼	52·5	1051	2175
14 tons Farmyard Manure (Plot 2)	36	0¾	56·5	2263	4810
400 lbs. Ammonia-salts alone (Plot 10*a*)	18	3¾	51·5	1207	2730
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	20	2¼	56·0	1275	2358
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	25	1	54·5	1499	3083
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	29	3¼	56·5	1832	3800
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	34	2½	55·9	2093	4740
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	34	2	53·7	2038	5475
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	34	2¾	52·6	2016	5860

The experimental crops were more than usually bulky wherever the manuring was liberal. With the smaller amounts of ammonia-salts (and mineral manure), the quantity of grain per acre was also slightly above the average; but with the heavy dressings of ammonia there was a considerable deficiency of corn, and a very undue proportion of straw. The weight per bushel of dressed corn was extremely low, though considerably lower with deficient mineral, or excessive nitrogenous manuring. There was less corn by ammonia-salts alone than by mixed mineral manure alone; and even when the ammonia-salts were used in conjunction with mineral manure, there was less corn, though a good deal more straw, from the use of the excessive amounts of 600 lbs. and 800 lbs., than when only 400 lbs. were employed.

It may be observed that this was the first of the years in which there was a reduction of potass and soda in all, and of magnesia in some of the cases, where these bases were formerly supplied.

In this and succeeding seasons the sulphate of potass was in all cases reduced to two-thirds the previous amount; the sulphate of soda to one-half in all cases of the so-called "mixed mineral manure," but only to two-thirds on Plots 12*a* and 12*b*. The sulphate of magnesia was, however, not reduced in the "mixed mineral manure," and only by one-third on plots 14*a* and 14*b*. Still, wherever potass, soda or magnesia were supplied at all, even the reduced amounts provided more of them annually than was taken off in the crops.

Upon the whole, the season of 1859, with its wet and warm growing and ripening, and wet harvest periods, was one of considerable amount of produce, but of very inferior characters for the formation and maturation of the grain.

Seventeenth Season, 1859-60.

October (1859) was upon the whole wet, the greater part of the month very mild, but the end very cold and frosty; November stormy, cold, and wet; December very cold, windy, and inclement until near the end, which was wet and mild. January (1860) was variable, but generally mild and wet; February very cold, with sharp frost and snow, ending with storms of rain and wind. The greater part of March was cold, with heavy showers and snow; the remainder was finer and warmer. April was very cold, with some snow and sharp frosts; the beginning of May was also cold, but the rest of the month warmer than usual, though very wet. June was very cold and very wet; July also very cold, with a moderate amount of rain, most of which fell after the middle of the month; August cold and very wet, and September also cold, but fine in the early part, though very wet in the latter. In June, July, August, and September, the dew point generally ranged low; but with the unusually low temperatures, the degree of humidity of the air was considerably above the average.

The winter of 1859-60 was thus alternately very cold and very mild, and upon the whole very wet; and the spring, summer, and autumn were very stormy, cold, wet, and unseasonable; indeed, more so than had been known for many years past. The crops were very late, the harvest being two or three weeks later than usual. Wheat was, in some localities, not deficient in bulk, but generally very much damaged, yielding but a small proportion of grain, and that of very low quality. The crop was, indeed, very much below the average both in quantity and quality.

The quantity of grain in the experimental field was generally only about three-fourths that of the average of the 12 years under

equal conditions of manuring; but the deficiency was proportionally less with the heavier dressings. The quantity of straw was also much below the average, though not quite so much so as that of the grain; but, as in the case of the latter, it was proportionally less deficient with the heavier manuring. The quality of grain, as indicated by the weight per bushel of the dressed corn, was throughout extremely low; in fact, lower than in any other year of the 20, excepting 1853.

The following abstract shows the character of the experimental crops:—

TABLE XVII.—SUMMARY of the Results of the SEVENTEENTH SEASON, 1859-60.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	12	3½	52·6	738	1459
14 tons Farmyard Manure (Plot 2)	32	1¼	55·5	1864	3440
400 lbs. Ammonia-salts alone (Plot 10*a*)	15	0½	49·5	905	2213
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	15	3¾	53·6	919	1620
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	14	2¾	53·2	870	1657
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	22	0	54·0	1268	2288
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of plots 7*a* and 7*b*)	27	3	54·3	1605	3070
Mixed Mineral Manure, and 600 lbs. Ammonia-salts, (mean of Plots 8*a* and 8*b*)	31	2	52·6	1773	3847
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	32	2¼	51·9	1873	4162

The experimental crop of the extraordinarily wet and cold growing and ripening season of 1860 was, therefore, in every respect very inferior, and much below the average. In yield of grain it was only about equal in quantity, and it was inferior in quality, to that of 1852, and inferior to it also in produce of straw. But it was superior both in quantity and quality of grain to the miserable crop of 1853, though even inferior to it in weight of straw.

Eighteenth Season, 1860-61.

October (1860) was, upon the whole, seasonable; November was very cold, with a good deal of rain; the beginning of December was mild, but the remainder of the month, and a great

part of January (1861) were extremely severe, many evergreens of long standing being killed during this period. The remainder of January, and February, were much milder, with comparatively little rain. There was, nevertheless, a good deal of cold wind during the latter month, as also pretty continuously through March, April, and the beginning of May, during which periods the rain-fall was below the average. The remainder of May was dry and fine, and even hot. June commenced with cold wind and rain, followed by an interval of fine and hot weather, and then a good deal of rain to the end of the month. July was generally seasonable as to temperature, with less than an average of rain. At the beginning of August some heavy rains fell, but, upon the whole, the month was very dry, fine, and favourable; and the fine weather continued, but with rather low temperature, and a good deal of wind, through the greater part of September, though towards the end of the month a great deal of rain fell. In June, both the dew point and degree of humidity of the air ranged high; but in July, August, and September, they were not far from the average.

The winter of 1860-61 was thus unusually severe, and the autumn-sown wheat-plant was reported to have suffered considerably. The spring of 1861 was generally dry, with a good deal of cold wind; but plentiful rains, and some hot weather, in June, brought the growing crops rapidly forward. July, August, and the greater part of September were, upon the whole, seasonable as to temperature, and degree of humidity of the atmosphere, with less than the usual amount of rain.

The wheat-crop was reported to be generally below the average in quantity per acre, the result being due chiefly to the loss of plant during the winter. It also suffered a good deal from rust, but benefitted much by the favourable weather of the latter part of the summer and of the autumn; fair average, and, in many cases, good quality, compensating somewhat for deficiency of quantity.

In produce of grain per acre, the unmanured, and the deficiently manured plots, were considerably below the average of the 12 years; but the more highly manured ones, though still below, were much more nearly up to the average, and the weight per bushel of dressed corn was throughout rather over the average. The produce of straw was also considerably below the average.

The experimental crop was, therefore, upon the whole, deficient both in quantity of total produce, and yield of grain per acre, but the quality of the latter was fully equal to the average. The crop was, however, in all respects superior to that of 1860;

and, excepting in amount of straw, it was, under the better conditions of manuring, superior to that of 1859 also.

The following is an abstract of the results obtained in the experimental field :—

TABLE XVIII.—SUMMARY of the Results of the EIGHTEENTH SEASON, 1860-61.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	11	1¼	57·4	736	1254
14 tons Farmyard Manure (Plot 2)	34	3½	60·5	2202	3101
400 lbs. Ammonia-salts alone (Plot 10a)	12	3½	55·0	854	1930
Mixed Mineral Manure alone (mean of Plots 5a and 5b)	15	1¾	59·1	1065	1552
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	18	0¼	58·4	1208	1799
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6a and 6b)	27	2¼	59·4	1787	2628
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7a and 7b)	34	3¾	58·9	2223	3528
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8a and 8b)	35	0	58·4	2240	3854
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16a and 16b)	37	0	58·3	2385	4383

Nineteenth Season, 1861-62.

October (1861) was generally mild, fine, and dry; November inclement, with an excess of rain, and unusually low temperatures. December was, upon the whole, warmer and drier than usual, but with a good deal of cold wind towards the end. January and February (1862) were, upon the whole, fine and dry, with a good deal of warmer and but little of colder weather than usual. March commenced with frosty weather, but the greater portion of it was unusually wet and mild. April was variable, with some unseasonably cold, but a good deal of warm weather, and a full average amount of rain. May was extremely wet, and, in the early part especially, unusually warm. June, July, and August were almost throughout unsettled, with a good deal of wind and rain, and unusually low temperatures, the nights especially being frequently very cold; and, although the atmosphere contained less than the average actual amount of moisture, with the low temperatures, the degree of humidity was not correspondingly low. September was also variable, with a good deal of rain

at the beginning and end of the month, but with fine and warm weather intermediately.

The winter of 1861-2 was, therefore, upon the whole, mild but the spring and summer were almost throughout wet, cold, and stormy. The wheat-crop of the country was almost universally reported to be under the average, in many cases root fallen, and also much mildewed.

The following results were obtained in the experimental field:—

TABLE XIX.—SUMMARY of the Results of the NINETEENTH SEASON, 1861-62.

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	Straw and Chaff.
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	16	0	57·8	996	1713
14 tons Farmyard Manure (Plot 2)	38	1½	61·0	2447	4195
400 lbs. Ammonia-salts alone (Plot 10*a*)	23	0¼	56·5	1457	2593
Mixed Mineral Manure alone (mean of Plots 5*a* and 5*b*)	17	3¼	59·0	1110	1850
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	20	1	58·1	1262	2186
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6*a* and 6*b*)	28	0¾	59·6	1756	2970
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7*a* and 7*b*)	35	3½	59·4	2333	3910
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8*a* and 8*b*)	39	1¾	59·2	2465	4679
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16*a* and 16*b*)	36	1	57·8	2229	4512

The experimental crops, without manure, with farmyard manure, and with the mixed mineral manure in conjunction with all but the most excessive amount of ammonia-salts, were fully equal in amount and quality of grain, and not much deficient in straw, compared with the average of the 12 years. But with mineral manure in conjunction with the very excessive amount of ammonia-salts, the produce of both grain and straw was considerably below the average. Notwithstanding the wetness of the most growing periods of the season, the prevailing low temperatures seem to have been adverse to the production of full amounts of gross produce; but the ripening period seems to have been not so unfavourable to the development of grain where there was moderate luxuriance of growth, and the crop was not too much laid; which, however, according to the reports, was the case

with a considerable proportion of the ordinary wheat-crop of the country.

Twentieth Season, 1862-3.

October (1862) was unusually warm, but with a good deal of wind and rain; November was cold, with comparatively little rain; December, and January and February (1863), were unusually mild, with a fair amount of rain in December and January, and but little in February. March was also upon the whole mild, with but little rain; and wheat showed unusually forward growth. April was very dry and warm. In May there were some refreshing rains, but the temperature was occasionally extremely low, and pretty nearly throughout rather below the average, with frequent storms of wind. The temperature in June was also generally rather below the average, and there was a good deal of rain; which, though needed, and much aiding growth, was so heavy as to lay the most forward and bulky crops. In July there was much less rain than usual, with moderately high day, but low night temperatures, and some sharp night frosts. August, with only moderate temperatures, but less than the usual amount of rain, was upon the whole favourable ripening and harvest weather. In September a good deal of rain fell, and the temperatures ranged rather low. In June, the condition of the atmosphere as to moisture was about the average for that month; but, in July, August, and September, both the actual amount and the degree of humidity were below the average.

With these characters of the season, the reports were almost unanimous that the wheat-crop of 1863 was considerably above the average; and such subsequent experience has proved it to be, both in quantity and quality. Indeed, such a yield, per acre, has not been known for very many years.

It would appear that the extraordinary result was due to almost unchecked growth from the first appearance of the plant above ground up to the time of harvest, rather than to any extraordinary characteristics of season at any one or more particular periods. With the extremely mild winter and early spring, the plant came early forward, and the rains, though sparing upon the whole, came when needed, whilst, though the temperature of the summer was seldom high, it was (if we except the night frosts of July) generally sufficient, and the condition of atmosphere otherwise favourable; so that it may be said that the whole season contributed to a lengthened and almost unbroken course of gradual accumulation.

The following Table shows the character of the results tained in this extraordinary season, in the experimental field;

TABLE XX.—SUMMARY of the Results of the TWENTIETH SEASON, 1862

MANURES. (Quantities per Acre.)	PRODUCE PER ACRE, &c.				
	Dressed Corn.			Total Corn.	S(
	Quantity.		Weight per Bushel.		
	Bush.	Pks.	lbs.	lbs.	
Unmanured (Plot 3)	17	1	62·7	1127	1
14 tons Farmyard Manure (Plot 2)	44	0	63·1	2886	4
400 lbs. Ammonia-salts alone (Plot 10a)	39	0½	62·6	2587	[illegible]
Mixed Mineral Manure alone (mean of Plots 5a and 5b)	19	2¾	63·0	1290	1
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	28	2¾	62·4	1852	[illegible]
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6a and 6b)	39	2¼	62·3	2528	[illegible]
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7a and 7b)	53	2¾	62·5	3492	[illegible]
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8a and 8b)	55	2¾	62·3	3614	[illegible]
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16a and 16b)	55	3¼	62·4	3659	[illegible]

The experimental wheat-crop of 1863, the 20th in succe on the same land, proved to be in quantity of both grain straw by far the most productive hitherto, and also in quali grain nearly the best yet obtained. In quantity of straw, or produce, the crop of 1854 the most nearly approached it; 1854 and 1857, both of which were years of extraordinary y both fell considerably short of 1863 in quantity of grain acre, and also in quality, as indicated by the weight bushel.

The season of 1863 was particularly marked by extraordi productiveness, in both corn and straw, under the influence liberal supply of ammonia-salts. Where the quantity applied not so excessive that the crops were over luxuriant, and much by the storms of wind and rain in June, more produce, especially more corn, was obtained for a given amount of monia applied than in any former year of the experiments.] where the amounts of ammonia-salts were the most excessive quantity of both corn and straw per acre was larger than in preceding season. But, doubtless owing to the heaviest having been laid so flat, the amount of increase yielded for increment of ammonia-salts supplied beyond 400 lbs. per

was not so great as in some other seasons. Thus, though in no preceding year had the produce obtained by the mixed mineral manure and the excessive amount of 800 lbs. of ammonia-salts exceeded 50 bushels of dressed corn per acre, that obtained in 1863 by the mixed mineral manure and only 400 lbs. of ammonia-salts was about 53¾ bushels, of 62½ lbs. weight per bushel; whilst the mixed mineral manure with 600 lbs. of ammonia-salts, gave scarcely 55¾ bushels, and with 800 lbs. scarcely 56 bushels.

Extraordinary as are these amounts of produce, even for good wheat-land cultivated and manured in the ordinary way, they are still more remarkable for the 20th crop of wheat in succession on land of only average wheat-producing quality, which has not been manured with farmyard manure for just a quarter of a century. Nevertheless, there can be no doubt that if the heavier crops had not been so much laid they would have yielded even considerably more. That they did not do so, in a season upon the whole so favourable for the effect of liberal nitrogenous manuring, shows that the higher amounts of ammonia-salts employed were not only excessive for average, but even for unusually favourable seasons.

In conclusion, in regard to these results, it should be observed that whilst the mixed mineral manure and ammonia-salts yielded as much as 55¾ bushels of dressed corn, and 6866 lbs. of straw, the same mixed mineral-manure, when used alone, gave scarcely 19¾ bushels of dressed corn, and only 1728 lbs. of straw. There was an increase, therefore, due to the action of ammonia-salts, of 36 bushels of dressed corn, and 5138 lbs. of straw. In this fact there is surely striking confirmation of the utter inadequacy of mineral-manures alone to enable the wheat-plant to obtain from the atmosphere a sufficiency of nitrogen for the production of full crops.

No idea is more fixed and prevalent in the farmer's mind than that, after all his labour and money have been expended, he is still at the mercy of the seasons for his reward. The foregoing short abstracts of the results obtained in different seasons, with the few comments made upon them, supply very interesting evidence relating to this point; and Tables XXII.—XXVI., inclusive, in the Appendix, afford the means of studying the subject in much more detail. But the extent of this dependence upon season will be made more strikingly manifest, by placing side by side, at one view, the results obtained by one and the same description and amount of manure in the least favourable, and in the most favourable of the last twelve seasons, during whic

the same manure has been applied year after year on the same land. This is done in the following Table:—

TABLE XXI.—SUMMARY of the Results obtained in 1853 and 1863, respectively.

MANURES. (Per Acre, per Annum.)	Produce per Acre, &c.							
	Dressed Corn.						Straw and Chaff.	
	Quantity.				Weight per Bushel.			
	1853.		1863.		1853.	1863.	1853.	1863
	Bush.	Pks.	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.
Unmanured (Plot 3)	5	3¾	17	1	45·9	62·7	1413	1600
14 tons Farmyard Manure (Plot 2)	19	0½	44	0	51·1	63·1	3372	4279
400 lbs. Ammonia-salts alone (Plot 10a)	9	3¾	39	0½	48·6	62·6	2049	3481
Mixed Mineral Manure alone (mean of Plots 5a and 5b)	10	0¾	19	2¾	48·6	63·0	2040	172[illegible]
Mixed Mineral Manure, and 100 lbs. Ammonia-salts (mean of Plots 21 and 22)	11	2½	28	2¾	49·8	62·4	2021	258[illegible]
Mixed Mineral Manure, and 200 lbs. Ammonia-salts (mean of Plots 6a and 6b)	18	0¼	39	2¼	51·5	62·3	2788	371[illegible]
Mixed Mineral Manure, and 400 lbs. Ammonia-salts (mean of Plots 7a and 7b)	23	2¾	53	2¾	52·0	62·5	3738	586[illegible]
Mixed Mineral Manure, and 600 lbs. Ammonia-salts (mean of Plots 8a and 8b)	23	1¾	55	2¾	51·8	62·3	3947	660[illegible]
Mixed Mineral Manure, and 800 lbs. Ammonia-salts (mean of Plots 16a and 16b)	25	0½	55	3½	52·3	62·4	4962	686[illegible]

It should be observed, that although both the quantity and th quality of corn were, under each of the conditions of manurin specified, lower in 1853 than in any other season of the las twelve, and hence the results of that year are selected to contras with those of 1863, yet the amounts of straw were much lowe in some other years. Indeed, the Table shows that in the cas of the mixed mineral manure alone the quantity of straw wa even higher in 1853 than in 1863. It was, however, in mo cases where ammonia-salts were used, one-half, and sometimes i a greater degree, more in 1863 than in 1853. Again, althoug the quantity of corn obtained was greater in 1863 than in an other year of the twelve wherever ammonia-salts were used, ye without manure, and with mixed mineral manure alone, it wa higher in several other years.

Notwithstanding these exceptions, which are themselves ver interesting and significant, the two seasons may still be taken a upon the whole representing, respectively the least and the mos favourable of those to which the experiments refer; and the di ference in the quantity and quality of the produce obtained by on and the same manure, in the one season compared with the othe s really most striking and instructive. Thus, in 1863 the pro duce of dressed corn exceeded that of 1853—without manure b 1 bushels, with farmyard manure by 25 bushels, with 400 lb

ammonia-salts alone by $29\frac{1}{4}$ bushels, with mineral manure alone by $9\frac{1}{2}$ bushels; and with mineral manure and ammonia-salts together—with 100 lbs. of ammonia-salts by 17 bushels, with 200 lbs. by $21\frac{1}{2}$ bushels, with 400 lbs. by 30 bushels, with 600 lbs. by $32\frac{1}{4}$ bushels, and with 800 lbs., by $30\frac{3}{4}$ bushels. The difference in quantity was, however, in reality much more than these figures indicate; for whilst the weight of each bushel of dressed corn was in 1863 from 62 to 63 lbs., in 1853 it in no case reached, and in some cases fell far short of, $52\frac{1}{2}$ lbs.

So far as the production of grain was concerned, therefore, the difference of result obtained in the two years was equally striking in point of both quantity and quality.

The important practical question of the amount of ammonia in manure expended for the production of a given amount of increase in one season compared with another, according to the quantity employed, and to the available supply of mineral constituents within the soil, will be made a subject of separate consideration in the Fourth Section of this Report.

The influence of each individual season, and of the extreme seasons, of the twenty, in tending to the development of much or little corn, much or little straw, and high or low quality of grain, under the different conditions of manuring, has now been briefly illustrated; but before leaving the question of the influence of season altogether, and passing to the more exclusive consideration of the effects of the different manures, it is desirable to endeavour to arrive at some conclusion as to whether the later or the earlier seasons were probably on the average the more favourable; so that a proper judgment may be formed as to whether the actual results obtained by the use of any particular description of manure year after year on the same land, may be referred with but a little reservation to the manure employed, or whether they have been, in any material degree, influenced by a progressive or retrogressive character of the seasons of growth.

There is an obvious inappropriateness in attempting to estimate the progressive or retrogressive productiveness of a series of seasons, by reference to the amounts of produce obtained on the application of a particular manure year after year on the same land, when the object of the estimate is to eliminate the influence of season from that due to the exhaustive or accumulative effect of the manure itself.

The annual produce without manure would appear, at first sight, to be the best index of the relative character of the seasons.

On the other hand, it has been seen that those seasons which were the most favourable for the unmanured, or for the merely mineral-manured plots, were not at all the most favourable for those manured highly with nitrogenous manures—that is, for those conditions under which alone large crops could be obtained. Hence, the best season for land in low condition is not the best for land in high condition.

But, by comparing the increasing or diminishing amount of produce from year to year, under very different conditions of manuring, a very fair judgment of the relative character of the earlier and the later seasons can be formed. To this end there are given at one view in Table XXII. (opposite) the average annual produce without manure, with ammonia-salts alone, and with farmyard manure, respectively over the first half, the second half, and the total period of the experiments; and also the average annual produce without manure, with mixed mineral manure alone, with ammonia-salts alone, with ammonia-salts and mixed mineral manure, and with farmyard manure, over the first six, the last six, and the total of the last twelve years of the experiments.

Taking first the whole period of the experiments (twenty years without manure and with farmyard manure, and nineteen with ammonia-salts alone), there is, without manure a slightly, though very slightly, increased annual produce of corn and total produce (though not of straw) over the last half as compared with the first half of the period; with ammonia-salts alone there is a decreased, and with farmyard manure a very much increased, rate of produce in the later years.

Thus, where the crop was simply dependent on the soil and season, the produce was somewhat higher in the later years; where the resources of the soil were overtaxed by the use of a large amount of ammonia-salts every year, the produce diminished; but where an excess of every constituent was annually applied, the crop enormously increased as the experiment proceeded.

Referring to the results obtained over the last twelve years ly, the latter half of that period gives, without manure, as much n, but scarcely as much straw as the former half; with xed mineral-manure alone (the condition nearest allied to the nmanured) there is a diminution, more particularly in the roduce of straw, in the later years; with ammonia-salts alone here is also a diminution, both of corn and straw, but in a somevhat less degree than when the whole period of twenty years is aken into the calculation. With ammonia-salts and mixed mineal manure together there is a considerable increase of corn, and,

MENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

XXII.—ANNUAL AVERAGE PRODUCE, &c., over the First half, the Second and the Total periods of the application of different Manures, each Year after on the same Land.

	Average Annual. First half of Period.	Average Annual. Second half of Period.	Average Annual. Total Period.	Duration of Total Period.
Dressed Corn, per Acre, in Bushels and Pecks.				
anured, every year	15 3¼	16 2¼	16 1	20 years—1844-1863.
nonia-salts alone, every year	24 3¾	23 3¾	24 1¾	19 years—1845-1863.
ns Farmyard Manure, every year	27 0¾	37 3¼	32 1¾	20 years—1844-1863.
anured, every year	15 1¼	15 2	15 2	
ed Mineral Manure alone, every year	18 3¼	18 0¼	18 1¾	
nonia-salts alone, every year	23 1	22 0	22 2½	12 years—1852-1863.
nonia-salts and Mixed Mineral Manure, every year	35 0¾	37 2¼	36 1¼	
ns Farmyard Manure, every year	33 1¼	37 1¾	35 1½	
Weight per Bushel of Dressed Corn, in lbs.				
anured, every year	58·3	57·6	57·9	20 years—1844-1863.
nonia-salts alone, every year	58·7	56·6	57·6	19 years—1845-1863.
ns Farmyard Manure, every year	59·8	60·3	60·0	20 years—1844-1863.
anured, every year	55·8	57·2	56·5	
ed Mineral Manure alone, every year	57·1	58·7	57·9	
nonia-salts alone, every year	55·9	55·8	55·9	12 years—1852-1863.
nonia-salts and Mixed Mineral Manure, every year	57·9	58·9	58·4	
ns Farmyard Manure, every year	58·8	59·8	59·3	
Total Corn, per Acre, in lbs.				
anured, every year	1018	1035	1026	20 years—1844-1863.
nonia-salts alone, every year	1628	1527	1575	19 years—1845-1863.
ns Farmyard Manure, every year	1757	2395	2076	20 years—1844-1863.
anured, every year	963	965	964	
ed Mineral Manure alone, every year	1171	1144	1157	
nonia-salts alone, every year	1463	1408	1435	12 years—1852-1863.
nonia-salts and Mixed Mineral Manure, every year	2195	2356	2275	
ns Farmyard Manure, every year	2102	2362	2232	
Total Straw (and Chaff), per Acre, in lbs.				
anured, every year	1693	1693	1693	20 years—1844-1863.
nonia-salts alone, every year	2846	2640	2737	19 years—1845-1863.
ns Farmyard Manure, every year	3071	3960	3515	20 years—1844-1863.
anured, every year	1678	1645	1662	
ed Mineral Manure alone, every year	2012	1783	1898	
nonia-salts alone, every year	2693	2513	2603	12 years—1852-1863
nonia-salts and Mixed Mineral Manure, every year	4233	4190	4212	
ns Farmyard Manure, every year	3794	3944	3869	
Total Produce (Corn and Straw), per Acre, in lbs.				
anured, every year	2711	2728	2719	20 years—1844-1863.
nonia-salts alone, every year	4474	4166	4312	19 years—1845-1863.
ns Farmyard Manure, every year	4828	6355	5591	20 years—1844-1863.
anured, every year	2641	2610	2626	
ed Mineral Manure alone, every year	3183	2927	3055	
nonia-salts alone, every year	4156	3921	4038	12 years—1852-1863.
nonia-salts and Mixed Mineral Manure, every year	6428	6546	6487	
ns Farmyard Manure, every year	5896	6306	6101	

though a diminution in the produce of straw, still some ii crease of total produce, during the later years. Finally, wit farmyard-manure there is an increase of both corn and stra in the latter as compared with the former half of the twel years, but in a much less degree than over the last ten compared with the first ten years of the whole period of t experiments.

The general result over the final twelve years is, then, th the average annual yield was, without manure, much the san over the whole period; that, notwithstanding the exhaustir effects of applying ammonia-salts every year, the annual dimin tion of produce under their influence was proportionally le during the latter half of the last twelve, than of the whole nin teen years of their use; that where ammonia-salts and all min ral constituents, except silica, were liberally supplied every yea the produce of corn increased, and that of the straw somewhat dim nished; lastly, that where an excess of every constituent requir by the crop was annually applied, as in the farmyard manure, t rate of increase from year to year was not so great during t later as during some of the earlier years.

That the unmanured produce should keep up its yield duri the later years, and that the produce by the exhaustive process applying ammonia-salts every year should diminish less duri the latter half of the twelve than of the whole nineteen years, seen sufficient indication that the later seasons of the experiments wei upon the whole, more favourable than the earlier ones. But this evidence may be added that derivable from the fact, th although the average weight per bushel of dressed corn witho manure, and with ammonia-salts alone, was considerably le during the latter than during the earlier half of the whole perio it was, nevertheless, without manure considerably higher, a with ammonia-salts alone about as high, during the latter as du ing the earlier half of the last twelve years. It is, therefore, clea that even under the most defective soil conditions the crop h either not deteriorated, or has done so in a less degree, in t ater years.

Upon the whole, then, it must be concluded, that the later yea of the experimental period were, on the average, slightly mo ...urable to the crop than the earlier ones. Assuming this ...ave been the case, it must be admitted, that the fact of the u nanured plot maintaining its produce throughout the who wenty years is probably in some degree due to the better avera the seasons themselves in the later years; and, consequentl nat had it been otherwise, the unmanured produce would ha ...own some slight decline in the later years, or rather, some slig

excess in the earlier ones, due to the accumulation of many previous courses of manuring and cropping.

These few illustrations will serve to indicate the degree, or limit, of the influence of any slight progressive improvement in the character of the seasons of the experimental period, and thus prepare the way for considering the effects of accumulation, or exhaustion, of constituents, from the manuring and cropping of preceding, on the produce of succeeding years.

(*To be continued.*)

APPENDIX.—TABLES.

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH (

APPENDIX.—TABLE I.—MANURES and PRODUCE; 1ST SEASON, 1843

Plots.	MANURES PER ACRE.								
	Farmyard Manure.	Farmyard Manure Ashes.	Silicate of Potass.[2]	Phosphate of Potass.[3]	Phosphate of Soda.[3]	Phosphate of Magnesia.[3]	Super-phosphate of Lime.[3]	Sulphate of Ammonia.	Ra Cak
	Tons.	Cwts.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs
0	Mixture of the residue of most of the other manures						..	..	..
1	..	..	..	..	..	..	700	..	15
2	14	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..
4	..	32[1]	..	..	..	..	..	..	..
5	..	..	..	..	..	..	700	..	..
6	..	..	..	..	..	420	350	..	..
7	..	..	..	..	325	..	350	..	..
8	..	..	..	375	..	..	350	..	..
9	..	..	..	..	..	..	630	65	..
10	..	..	220	..	..	..	560	..	..
11	..	..	..	..	..	..	350	..	3
12	..	..	..	..	162½	210	350	..	..
13	..	..	..	187½	..	210	350	..	..
14	..	..	275	..	..	210	350	..	..
15	..	..	110	150	..	168	350	..	..
16	..	..	110	75	65	84	350	65	..
17	..	..	110	75	65	84	350[4]	65	..
18	..	..	110	75	65	84	350	65	15
19	..	..	110	..	81	105	350	81	..
20	Unmanured		..	..	..	..	..	..	..
21 } 22 }	Mixture of the residue of most of the other manures						..	..	..

[1] The farmyard dung was burnt slowly in a heap in the open air to an imperfect or coaly ash, and 32 cw of ash represent 14 tons of dung.

[2] The silicate of potass was manufactured at a glass-house by fusing equal parts of pearl-ash and sand. T product was a transparent glass, slightly deliquescent in the air, which was ground to powder under edge-stone

[3] The manures termed superphosphate of lime, phosphate of potass, phosphate of soda, and phosphate magnesia, were made by acting upon bone-ash by means of sulphuric acid in the first instance, and in the ca of the alkali salts and the magnesian one neutralizing the compound thus obtained by means of cheap preparati of the respective bases. For the superphosphate of lime the proportions were 5 parts bone-ash, 3 parts water, 3 parts sulphuric acid of sp. gr. 1·84; and for the phosphates of potass, soda, and magnesia, they were 4 pa bone-ash, water as needed, 3 parts sulphuric acid of sp. gr. 1·84, and equivalent amounts, respectively, of pearl-a

Year after Year on the same Land.

and Seed (Old Red Lammas) sown Autumn 1843.

Dressed Corn. Quantity.[5] Bush.	Pecks.	Weight per Bushel. lbs.	Offal Corn.[6] lbs.	Total Corn. lbs.	Straw and Chaff. lbs.	Total Produce (Corn and Straw). lbs.	Increase per Acre by Manure. Corn. lbs.	Straw and Chaff. lbs.	Total Produce. lbs.	Offal Corn to 100 Dressed
19	3¾	58·5	61	1228	1436	2664	305	316	621	..
16	3	59·0	52	1040	1203	2243	117	88	200	..
20	1¾	59·3	64	1276	1476	2752	353	356	709	..
15	0	58·5	46	923	1120	2043	..	..	..	..
14	2½	58·0	44	888	1104	1992	−35	−16	−51	..
15	2½	58·3	48	956	1116	2072	33	−4	29	..
15	1	60·0	48	964	1100	2064	41	−20	21	..
15	2	60·3	49	984	1172	2156	61	52	113	..
15	0¾	61·8	49	980	1160	2140	57	40	97	..
19	2½	62·3	64	1280	1368	2648	357	248	605	..
15	1¾	62·0	50	1008	1112	2120	85	− 8	77	..
17	0¾	61·8	56	1116	1200	2316	193	80	273	..
15	2	61·5	50	1004	1116	2120	81	− 4	77	..
16	1½	62·5	54	1072	1204	2276	149	84	233	..
15	3	61·8	51	1016	1176	2192	93	56	149	..
16	3½	62·0	55	1096	1240	2336	173	120	293	..
19	3½	62·5	65	1304	1480	2784	381	360	741	..
18	3¾	62·3	62	1240	1422	2662	317	302	619	..
20	3¾	62·0	68	1368	1768	3136	445	648	1093	..
24	1½	61·8	79	1580	1772	3352	657	652	1309	..
..		..	..	..	..	..	..	..	..	..
..		..	..	..	..	..	..	..	..	..

...sh, or a mixture of 1 part medicinal carbonate of magnesia and 4 parts magnesian limestone. Th... ...se, all lost weight considerably by the evolution of water and carbonic acid.

...with unburnt bones.

In this first season neither the weight nor the measure of the offal corn was recorded separate... ...the bushels and pecks of total corn (including offal) have erroneously been given as d... ...records more in conformity with those relating to the other years, 5 per cent., by weigh... ...the total corn previously stated as dressed corn, and is recorded as offal corn; this bein... ...proportion, judging from the character of the season, the bulk of the crop, and the weight p... ...corn. Although not strictly correct, the statements of dressed corn as amended in this... ...will approximate more nearly to the truth, and be more comparable with those relati... ...those hitherto recorded.

EXPERIMENTS AT ROTHAMSTED ON THE GROW

APPENDIX.—TABLE II.—MANURES and PRODUCE; 2ND SEASON

Plots.	Manures per Acre.										
	Farm-yard Manure.	Silicate of Potass.[1]	Phosphate of Potass.[2]	Super-phosphate of Lime.[2]	Bone-ash.	Muriatic Acid.	Guano.	Sulphate of Ammonia.	Muriate of Ammonia.[3]	Carbonate of Ammonia.	Rape Cake.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	Mixture of the residue of most of the other manures								..	..	..
1	..	112	..	..	..	..	..	224	..	..	560
2	14	..	..	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..	..	..
4	..	..	..	..	112	112	..	112	..	..	..
5[4] {1	Unmanured		..	..	..	..	..	..	..	..	..
5[4] {2	..	..	..	..	..	..	..	..	..	252[3]	..
6	..	..	..	112	..	..	..	112	..	..	560
7	..	..	..	112	..	..	..	112	..	..	..
8	..	..	..	..	..	..	..	112	..	..	560
9	..	..	..	..	..	..	..	168[5]	168[5]	..	..
10	..	..	..	..	..	..	..	168[6]	168[6]	..	..
11	..	..	..	280	..	..	..	224	..	..	560
12	..	..	280	..	..	..	..	224	..	..	560
13	..	..	..	..	..	..	336[7]	..	..	..	..
14	..	..	..	..	..	..	672[8]	..	..	..	..
15	..	..	..	..	224	224	..	224	..	..	..
16	..	..	..	224	..	..	..	56	56	..	560
17	..	..	..	224	..	..	..	112	112	..	280
18	..	..	..	336	..	..	..	112	112	..	..
19	..	..	..	..	112	112	..	112	..	..	336
20	Unmanured		..	..	..	..	..	..	..	..	..
21} 22}	Mixture of the residue of most of the other manures								..	..	..

[1] The silicate of potass was manufactured at a glass-house by fusing equal parts of pearl-sand. The product was a transparent glass, slightly deliquescent in the air; it was ground to under edge-stones.

[2] The manures termed superphosphate of lime and phosphate of potass were made by upon bone-ash by means of sulphuric acid, and in the case of the potass salt neutralizing the co thus obtained by means of pearl-ash. For the superphosphate of lime the proportions were bone-ash, 3 parts water, and 3 parts sulphuric acid of sp. gr. 1·84; and for the phosphate of 4 parts bone-ash, water as needed, 3 parts sulphuric acid of sp. gr. 1·84, and an equivalent of pearl-ash. The mixtures, of course, lost weight considerably by the evolution of wat carbonic acid.

T YEAR AFTER YEAR ON THE SAME LAND.

:ES and SEED (Old Red Lammas) sown March 1845.

Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
Quantity.		Weight per Bushel.									
ush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
32	0	56·5	159	1967	3977	5944	526	1265	1791	10·9	49·5
26	1¼	54·8	248	1689	3699	5388	248	987	1235	17·3	45·7
32	0	56·8	151	1967	3915	5882	526	1203	1729	8·9	50·2
23	0¾	56·5	131	1441	2712	4153	..	..	..	8·7	53·1
29	2½	58·0	161	1879	3663	5542	438	951	1389	9·4	51·3
22	2¼	57·5	134	1431	2684	4115	−10	−28	−38	10·1	53·3
26	3¾	57·3	190	1732	3599	5331	291	887	1178	14·2	48·1
28	2¾	57·8	214	1871	3644	5515	430	932	1362	14·1	57·3
26	2¾	57·0	161	1682	3243	4925	241	531	772	11·3	51·9
27	0½	56·3	194	1716	3663	5379	275	951	1226	14·0	46·9
33	1½	58·3	187	2131	4058	6189	690	1346	2036	10·2	52·5
31	3¼	56·3	191	1980	4266	6246	539	1554	2093	12·3	46·4
30	3	56·0	158	1880	4104	5984	439	1392	1831	11·3	45·8
28	2¼	55·3	264	1842	4134	5976	401	1422	1823	17·8	44·5
25	0	56·3	152	1558	3355	4913	117	643	760	12·0	46·4
27	1	57·5	176	1743	3696	5439	302	984	1286	16·2	47·1
32	3¾	57·5	209	2103	4044	6147	662	1332	1994	11·8	52·0
32	3¼	56·3	182	2028	4191	6219	587	1479	2066	11·1	48·4
32	0¾	55·8	299	2093	3826	5919	652	1114	1766	15·2	54·7
33	0¼	56·5	180	2048	3819	5867	607	1107	1714	11·2	53·6
34	3	57·0	133	2114	4215	6329	673	1503	2176	9·1	50·2
24	2¾	56·0	113	1495	3104	4599	54	392	446	9·7	48·2
..		..	..	..	..	..	..	..	..	..	..

The medicinal carbonate of ammonia; it was dissolved in water and top-dressed.
Plot 5 was 2 lands wide (in after years, respectively, 5a and 5b); 5¹ consisting of 2 alternate [illegible] lengths across both lands, and 5² of the 2 remaining one-fourth lengths.
Top-dressed at once.
Top-dressed at 4 intervals.
[illegible]
[illegible]

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH

APPENDIX.—TABLE III.—MANURES and PRODUCE; 3RD SEASON, 18

Plots.	MANURES PER ACRE.								Superphosphate of Lime.				
	Farm-yard Manure.	Ash from 3 loads (3888 lbs.) Wheat-straw.	Liebig's Wheat-manure.	Peruvian Guano.	Silicate of Potass.	Pearl-ash.	Soda-ash.	Magnesian Limestone.	Bone-Ash.	Sulphuric Acid (Sp. gr. 1·7.)	Muriatic Acid.	Sulphate of Ammonia.	Muriate of Ammonia.
	Tons.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	336	..	..	..	..	..	..	..	..	..
1	..	..	..	..	..	..	..	..	224	..	..	..	..
2	14	..	..	..	..	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	224	..	224	224	..
5a 1	..	Straw-ash.	..	..	..	..	..	..	..	..	..	..	..
5a 2	..		..	..	..	..	..	..	..	..	..	224[1]	..
5b 1	..		..	..	..	..	..	..	..	..	..	..	..
5b 2	..		..	..	..	..	..	..	..	..	..	224[1]	..
6a	..	..	448	..	..	..	..	..	..	..	..	..	..
6b	..	..	448	..	..	..	..	..	..	..	..	112	112
7a	..	..	448	..	..	..	..	..	..	..	..	..	..
7b	..	..	448	..	..	..	..	..	..	..	..	112	112
8a	..	..	..	..	..	..	..	..	224	..	..	..	..
8b	..	..	..	..	..	..	..	..	224	..	..	112	112
9a	..	..	..	..	..	..	..	..	..	..	..	..	..
9b	..	..	..	..	..	..	..	..	..	..	..	224	..
10a	..	..	..	..	..	..	..	..	..	..	..	224	..
10b	Unmanured		..	..	..	..	..	...	..	..	..	..	..
11a	..	..	..	..	..	..	..	..	224	224	..	..	..
11b	..	..	..	..	..	..	..	..	224	224	..	112	112
12a	..	..	..	..	..	..	180	..	224	224	..	..	..
12b	..	..	..	..	..	..	180	..	224	224	..	112	112
13a	..	..	..	..	..	200	..	..	224	224	..	..	..
13b	..	..	..	..	..	200	..	..	224	224	..	112	112
14a	..	..	..	..	..	..	..	84	224	224	..	..	..
14b	..	..	..	..	..	..	..	84	224	224	..	112	112
15a	..	..	..	..	..	..	..	..	224	..	224	224	..
15b	..	..	..	..	224	..	..	..	224	..	224	224	..
16a	..	..	..	..	..	67	60	84	224	224	..	..	..
16b	..	..	..	..	..	67	60	84	224	224	..	224	..
17a	..	..	..	..	..	67	60	84	224	224	..	112	112
17b	..	..	..	..	..	67	60	84	224	224	..	224	..
18a	..	..	..	..	..	67	60	84	224	224	..	112	112
18b	..	..	..	..	..	67	60	84	224	224	..	..	..
19	..	..	..	..	..	..	..	..	112	..	112	112	..
20, 21, 22	Mixture of the residue of most of the other manures									..	..	..	..

[1] Top-dressed in the Spring.

HEAT YEAR AFTER YEAR ON THE SAME LAND.

NURES and SEED (Old Red Lammas) sown Autumn 1845.

	Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Co t 1(Str
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
	28	1¾	62·3	134	1906	2361	4467	699	1048	1747	7·3	74
	22	0¾	62·6	120	1509	1953	3462	302	440	742	8·1	77
	27	0¾	63·0	113	1826	2454	4280	619	941	1560	6·6	74
	17	3¾	63·8	64	1207	1513	2720	..	..	..	7·4	79
	25	3¾	63·5	130	1777	2390	4167	570	877	1447	7·8	74
1	19	0½	63·7	87	1305	1541	2846	98	28	126	..	84
2	27	0	63·0	126	1827	2309	4136	620	796	1416	..	79
1	23	2½	63·4	100	1598	1721	3319	391	208	599	..	92
2	30	0¾	63·3	165	2076	2901	4977	869	1388	2257	..	71
	20	1½	63·7	102	1400	1676	3076	193	163	356	7·0	83
	29	0¾	63·5	114	1967	2571	4538	760	1058	1818	5·3	76
	22	3¼	63·0	97	1534	1968	3502	327	405	732	6·8	77
	31	3	63·4	150	2163	3007	5170	956	1494	2450	7·5	72
	22	3¼	63·5	101	1549	1963	3512	342	450	792	7·1	78
	29	0¾	63·6	132	1988	2575	4563	781	1062	1843	7·2	77
	23	2¾	63·0	122	1614	2033	3647	407	520	927	7·9	79
	28	3½	63·3	114	1942	2603	4545	735	1090	1825	7·0	74
	27	1½	63·6	109	1850	2244	4094	643	731	1374	6·4	82
	17	2½	63·8	92	1216	1455	2671	9	−58	−49	7·8	83
	23	1¾	63·3	145	1628	2133	3761	421	620	1041	9·8	76
	30	0½	63·2	155	2055	2715	4770	848	1202	2050	6·1	75
	24	1½	63·0	125	1661	2163	3824	454	650	1104	7·9	76
	28	2¾	63·4	136	1955	2554	4509	748	1041	1789	7·4	76
	24	0	63·5	136	1660	2327	3987	453	814	1267	9·1	71
	29	1¾	63·2	138	1998	2755	4753	791	1242	2033	7·3	72
	23	2½	63·0	117	1605	2031	3636	398	518	916	7·7	79
	26	2½	63·4	124	1812	2534	4356	605	1021	1626	7·4	71
	31	1¾	62·5	147	2112	2936	5048	905	1423	2328	7·5	71
	27	2¾	63·0	117	1861	2513	4374	654	1000	1654	5·9	74
	23	3	62·5	108	1592	2067	3659	385	554	939	7·0	77
	30	1	62·7	122	2019	2836	4855	812	1323	2135	6·6	71
	33	2¾	62·8	129	2241	3278	5519	1034	1765	2799	5·8	68
	30	2	63·0	113	2034	2784	4818	827	1271	2098	5·9	73
	31	0	62·8	103	2048	2838	4886	841	1325	2166	5·1	72
	21	1	62·0	157	1474	1893	3367	267	380	647	6·6	77
	28	3	62·0	107	1889	2425	4314	682	912	1594	5·8	77
	..		..	..	..	..	..	..	..	..	..	..

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF

APPENDIX.—TABLE IV.—MANURES and PRODUCE; 4TH SEASON, 1846-7.

Plots.	Manures per Acre.							
	Farmyard Manure.	Peruvian Guano.	Superphosphate of Lime. Bone-ash.	Superphosphate of Lime. Sulphuric Acid (Sp. gr. 1·7).	Superphosphate of Lime. Muriatic Acid.	Sulphate of Ammonia.	Muriate of Ammonia.	Rice.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	500	..	..	..	..	..	..
1	..	..	200	..	200	350	50	..
2	14	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..
4	..	..	200	..	200	300	..	..
5a	..	..	200	200	..	150	150	..
5b	..	..	200	200	..	150	150	500
6a	..	..	..	..	..	150	150	..
6b	..	..	..	..	..	150	150	..
7a	..	..	..	..	..	150	150	..
7b	..	..	..	..	..	150	150	..
8a	..	..	200	200	..	150	150	500
8b {1	..	..	200	200	..	200	200	..
9a {2	..	..	..	..	..	..	..	2240
	..	..	..	..	..	150	150	..
9b	..	..	..	..	..	150	150	..
10a	..	..	..	..	..	150	150	..
10b	..	..	..	..	..	150	150	..
11a	..	..	100	100	..	150	150	..
11b	..	..	100	100	..	150	150	..
12a	..	..	100	100	..	150	150	..
12b	..	..	100	100	..	150	150	..
13a	..	..	100	100	..	150	150	..
13b	..	..	100	100	..	150	150	..
14a	..	..	100	100	..	150	150	..
14b	..	..	100	100	..	150	150	..
5a	..	..	200	..	200	300	..	500
5b	..	..	200	..	200	300	..	500
[illegible]	..	..	100	100	..	150	150	..
6	..	..	100	100	..	150	150	..
7a	..	..	100	100	..	150	150	..
7b	..	..	100	100	..	200	200	..
8a	..	..	100	100	..	150	150	..
[illegible]	..	..	100	100	..	150	150	..
[illegible]	..	..	100	..	100	300	..	500
[illegible]	Unmanured		..	..	..	..	..	..
[illegible]	Mixture of the residue of most of the other manures						..	..

heat Year after Year on the same Land.

anures and Seed (Old Red Lammas) sown end of October 1846.

lots.	Produce per Acre, &c. — Dressed Corn. — Quantity.		Weight per Bushel.	Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Increase per Acre by Manure. — Corn.	Straw and Chaff.	Total Produce.	Offal Corn to 100 Dressed.	Corn to 100 Straw
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	30	2¾	61·1	156	2031	3277	5308	908	1375	2283	8·2	61·9
1	32	1	61·2	147	2119	3735	5854	996	1833	2829	7·2	56·7
2	29	3¾	62·3	117	1981	3628	5609	858	1726	2584	6·2	54·6
3	16	3½	61·0	95	1123	1902	3025	..	..	..	8·9	59·0
4	27	1¾	61·9	82	1780	2948	4728	657	1046	1703	4·7	60·3
5a	29	0	61·8	130	1921	3412	5333	798	1510	2309	7·1	56·3
5b	32	2	61·4	136	2132	3721	5853	1009	1819	2827	6·6	57·2
a	24	3¼	62·1	122	1663	2786	4449	540	884	1424	7·8	59·6
b	24	1¾	61·6	127	1632	2803	4435	509	901	1410	8·2	58·2
a	27	3¼	61·7	118	1834	3151	4985	711	1249	1960	6·8	58·2
b	25	1¼	61·5	125	1682	2953	4635	559	1051	1610	7·9	56·9
a	32	1¾	62·1	102	2115	3683	5798	992	1781	2773	5·5	57·4
b	30	3	61·7	123	2020	3720	5740	897	1818	2715	6·3	54·3
a {1	22	3	62·5	..	1477	2506	3983	228	604	..	..	53·9
a {2	26	2	61·0	..	1755	3052	4807	632	1150	..	..	57·5
b	26	0	61·3	123	1717	2858	4575	594	956	1550	..	60·1
a	25	3	61·5	118	1702	2891	4593	579	989	1568	7·3	58·8
b	25	2¾	61·2	133	1705	2874	4579	582	972	1554	8·2	59·3
a	30	3½	61·6	142	2044	3517	5561	921	1615	2536	6·3	59·5
b	29	1¾	61·8	123	1941	3203	5144	818	1301	2119	6·7	60·6
a	29	2	62·0	124	1953	3452	5405	830	1550	2380	6·6	57·1
b	27	0½	61·8	121	1796	3124	4920	673	1222	1895	7·1	57·4
a	29	2½	62·5	108	1959	3306	5265	836	1404	2240	5·5	57·8
b	27	1½	62·3	96	1801	3171	4972	678	1269	1947	5·3	56·7
a	28	0¾	62·8	175	1944	3362	5306	821	1460	2281	9·7	59·5
b	26	3¾	62·8	166	1856	3006	4862	733	1104	1837	9·8	61·7
5a	32	3	63·0	151	2214	3876	6090	1091	1974	3065	7·2	57·1
5b	32	0	62·6	137	2140	3617	5757	1017	1715	2732	6·6	59·1
6a	29	1¼	62·3	132	1959	3417	5376	836	1515	2351	6·9	57·3
6b	34	2¼	62·6	119	2283	4012	6295	1160	2110	3270	5·2	56·9
7a	33	3	62·3	119	2222	4027	6249	1099	2125	3224	5·6	55·1
7b	35	1¾	62·0	117	2314	4261	6575	1191	2359	3550	6·4	54·3
8a	32	0¾	62·7	142	2160	3852	6012	1037	1950	2987	6·9	56·0
8b	29	1½	62·9	181	2029	4164	6193	906	2262	3168	9·7	48·7
9	32	3	62·8	140	2195	4202	6397	1072	2300	3372	6·7	52·2
10	20	0¾	62·5	70	1332	2074	3406	209	172	381	4·9	64·2
}	..		..	..	..	..	..	..	..	..	..	..

EXPERIMENTS AT ROTHAMSTED ON THE GROWT

APPENDIX.—TABLE V.—MANURES and PRODUCE; 5TH SEASON, 18

Plots.	Manures per Acre.									
	Farm-yard Manure.	Pearl-ash.	Soda-ash.	Sulphate of Magnesia.	Super-phosphate of Lime.	Superphosphate of Lime. Bone-ash.	Superphosphate of Lime. Sulphuric Acid (Sp. gr. 1·7).	Superphosphate of Lime. Muriatic Acid.	Sulphate of Ammonia.	Muriate of Ammonia.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	..	2240	..	..	..	..	..
1	..	..	..	..	..	..	..	..	..	..
2	14	..	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..	..
4	..	..	..	..	..	200	..	200	300	..
5*a*	..	300	200	100	..	200	150	..	250	250
5*b*	..	300	200	100	..	200	150	..	200	200
6*a*	..	..	..	..	..	400	300	..	200	200
6*b*	..	..	..	..	..	200	150	..	200	200
7*a*	..	..	..	..	..	400	300	..	150	150
7*b*	..	..	..	..	..	200	150	..	150	150
8*a*	..	300	200	100	..	200	150	..	..	..
8*b*	..	300	200	100	..	200	150	..	..	..
9*a*	..	..	..	..	..	200	150	..	..	..
9*b*	..	..	..	..	..	200	150	..	150	150
10*a*	..	..	..	..	..	..	..	..	150	150
10*b*	..	300	200	100	..	200	150	..	150	150
11*a*	..	..	..	..	..	200	150	..	150	150
11*b*	..	..	..	..	..	200	150	..	200	200
12*a*	..	300	..	..	..	200	150	..	150	150
12*b*	..	300	..	..	..	200	150	..	200	200
13*a*	..	300	..	..	..	200	150	..	150	150
13*b*	..	300	..	..	..	200	150	..	200	200
14*a*	..	300	..	..	..	200	150	..	150	150
14*b*	..	300	..	..	..	200	150	..	200	200
15*a*	..	300	200	100	..	200	..	200	300	..
15*b*	..	300	200	100	..	200	..	200	300	..
16*a*	..	300	200	100	..	200	150	..	150	150
16*b*	..	300	200	100	..	200	150	..	150	150
17*a*	..	300	200	100	..	200	150	..	200	200
17*b*	..	300	200	100	..	200	150	..	200	200
18*a*	..	300	200	100	..	200	150	..	150	150
18*b*	..	300	200	100	..	200	150	..	150	150
19	..	..	..	..	..	200	..	200	300	..
20	Unmanured		..	..	..	..	..	..	..	..
21 } 22 }	..	..	..	..	..	..	..	..	..	..

Wheat Year after Year on the same Land.

Manures and **Seed** (Old Red Lammas) sown Autumn 1847.

Plots.	Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	19	0¾	58·4	138	1259	2074	3333	307	362	669	13·4	60·7
1	16	0¾	59·6	160	1124	1735	2859	172	23	195	16·3	64·7
2	25	2¾	58·2	210	1705	3041	4746	753	1329	2082	13·8	56·0
3	14	3	57·3	106	952	1712	2664	..	..	..	12·1	55·6
4	24	0½	58·5	172	1583	2713	4296	631	1001	1632	12·0	58·3
5*a*	29	3½	59·2	144	1911	3266	5177	959	1554	2513	7·9	58·5
5*b*	30	3¼	59·1	107	1932	3533	5465	980	1821	2801	5·8	57·5
6*a*	24	3¼	58·8	214	1672	2878	4550	720	1166	1886	14·6	58·0
6*b*	26	3	56·9	216	1737	2968	4705	785	1256	2041	14·0	58·5
7*a*	30	3½	59·4	106	1936	3088	5024	984	1376	2360	5·7	62·6
7*b*	29	3¾	59·6	187	1963	3413	5376	1011	1701	2712	10·3	57·5
8*a*	19	3	56·2	154	1263	2317	3580	311	605	916	13·6	54·5
8*b*	19	0¾	59·4	127	1267	2148	3415	315	436	751	11·1	58·8
9*a*	18	2¼	56·7	125	1181	1945	3126	229	233	462	11·6	60·7
9*b*	25	0¼	58·3	208	1669	2918	4587	717	1206	1923	13·9	57·1
10*a*	19	1	58·1	215	1334	2367	3701	382	655	1037	19·0	56·3
10*b*	25	0¼	57·8	155	1604	2926	4530	652	1214	1866	10·6	54·8
11*a*	29	1½	59·6	233	1984	3274	5258	1032	1562	2594	13·1	60·6
11*b*	24	3	57·9	207	1641	2898	4539	689	1186	1875	14·1	56·4
12*a*	29	3	59·3	174	1938	3390	5328	986	1678	2664	9·3	57·2
12*b*	26	0¾	59·2	167	1717	2880	4597	765	1168	1933	10·7	59·6
13*a*	29	1½	57·9	253	1955	3290	5245	1003	1578	2581	14·7	59·4
13*b*	25	3¼	58·4	224	1730	3072	4802	778	1360	2138	14·6	56·3
14*a*	28	0¼	58·8	184	1834	3257	5091	882	1545	2427	11·1	56·3
14*b*	25	2¼	58·5	227	1726	2897	4623	774	1185	1959	15·1	59·5
15*a*	22	3½	58·1	242	1571	2937	4508	619	1225	1844	18·1	53·4
15*b*	24	2¾	56·9	202	1607	3016	4623	655	1304	1959	14·1	53·2
16*a*	29	3¼	60·0	184	1973	3115	5088	1021	1403	2424	10·2	63·3
16*b*	30	1¾	58·4	171	1948	3380	5328	996	1668	2664	9·4	57·6
17*a*	27	2¼	59·7	285	1933	3296	5229	981	1584	2565	17·0	58·6
17*b*	28	3¾	59·7	222	1946	3324	5270	994	1612	2606	12·6	58·5
18*a*	26	3	59·2	150	1734	2935	4669	782	1223	2005	9·2	59·0
18*b*	26	2¾	59·6	215	1804	3056	4860	852	1344	2196	13·3	58·7
19	29	1¾	56·2	185	1838	3295	5133	886	1583	2469	10·4	55·7
20	16	0½	58·3	111	1050	1721	2771	98	9	107	11·3	61·0
21 } 22 }	..		..	..	..	..	..	..	..	..	..	..

EXPERIMENTS AT ROTHAMSTED ON THE GROWT

APPENDIX.—TABLE VI.—MANURES and PRODUCE; 6TH SEASON, 18

Plots.	MANURES PER ACRE.								
	Farm-yard Manure.	Pearl-ash.	Soda-ash.	Sulphate of Magnesia.	Superphosphate of Lime.			Sulphate of Ammonia.	Muriate of Ammonia.
					Bone-ash.	Sulphuric Acid (Sp. gr. 1·7).	Muriatic Acid.		
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	..	600	450	..	..	..
1	..	600	400	200	..	..	..	..	..
2	14	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..
4	..	..	..	..	200	..	200	300	..
5a	..	300	200	100	200	150	..	250	250
5b	..	300	200	100	200	150	..	200	200
6a	..	300	200	100	200	150	..	200	200
6b	..	300	200	100	200	150	..	200	200
7a	..	300	200	100	200	150	..	200	200
7b	..	300	200	100	200	150	..	200	200
8a	Unmanured		..	..	..	..	..	..	..
8b	..	..	..	..	..	..	..	..	..
9a	..	..	..	..	..	..	..	..	..
9b	Unmanured		..	..	..	..	..	..	..
10a	..	..	..	..	..	..	..	200	200
10b	..	..	..	..	..	..	..	200	200
11a	..	..	..	..	200	150	..	200	200
11b	..	..	..	..	200	150	..	200	200
12a	..	300	..	..	200	150	..	200	200
12b	..	300	..	..	200	150	..	200	200
13a	..	300	..	..	200	150	..	200	200
13b	..	300	..	..	200	150	..	200	200
14a	..	300	..	..	200	150	..	200	200
14b	..	300	..	..	200	150	..	200	200
15a	..	300	200	100	200	..	200	300	..
15b	..	300	200	100	200	..	200	300	..
16a	..	300	200	100	200	150	..	200	200
16b	..	300	200	100	200	150	..	200	200
17a	..	300	200	100	200	150	..	200	200
17b	..	300	200	100	200	150	..	200	200
18a	..	300	200	100	200	150	..	200	200
18b	..	300	200	100	200	150	..	200	200
	..	..	..	..	200	..	200	300	..
20	Unmanured		..	..	..	..	..	..	..
21, 22	Mixture of the residue of most of the other manures							..	..

EAT YEAR AFTER YEAR ON THE SAME LAND.

NURES and SEED (Red Cluster) sown Autumn 1848.

ts.	Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
[illegible]	..		..	..	..	..	..	..	..	..	..	..
1	..		..	..	..	..	..	..	..	..	..	..
2	31	0	63·8	107	2068	3029	5097	839	1415	2254	4·7	68·3
3	19	1	61·4	47	1229	1614	2843	..	..	..	3·9	76·1
4	30	0	63·0	110	2063	2645	4708	834	1031	1865	5·6	78·0
5a	37	1¼	63·1	89	2446	3589	6035	1217	1975	3192	3·7	68·1
5b	39	3½	63·4	97	2651	3824	6475	1422	2210	3632	5·0	69·3
6a	36	1¼	63·0	117	2410	3072	5482	1181	1458	2639	5·1	78·4
6b	37	3¾	63·0	94	2484	3516	6000	1255	1902	3157	3·9	70·6
7a	38	2½	63·1	137	2576	3584	6160	1347	1970	3317	5·6	71·9
7b	37	3¾	62·9	141	2531	3396	5927	1302	1782	3084	5·9	74·5
8a	22	3	61·7	76	1481	1815	3296	252	201	453	5·3	81·6
8b	31	2½	63·0	85	2080	3166	5246	851	1552	2403	4·3	65·7
9a	30	2¾	62·8	111	2035	2683	4718	806	1069	1875	5·8	75·8
9b	22	1¼	62·3	80	1475	1810	3285	246	196	432	5·7	81·5
0a	32	2¼	62·3	112	2141	2851	4992	912	1237	2149	5·5	75·1
0b	32	1¼	63·3	110	2157	2960	5117	928	1346	2274	5·3	72·9
1a	35	0½	62·6	121	2317	2892	5209	1088	1278	2366	5·6	80·1
1b	32	1¼	63·0	112	2149	2942	5091	920	1328	2248	5·5	73·0
2a	35	3¼	64·3	93	2396	3371	5767	1167	1757	2924	4·1	71·1
2b	34	1¼	64·3	71	2277	3300	5577	1048	1687	2735	3·2	69·0
3a	34	3¾	64·1	101	2340	3236	5576	1111	1622	2733	4·5	72·3
3b	34	2¼	64·1	129	2346	3246	5592	1117	1632	2749	5·8	72·3
14a	34	1½	64·8	56	2266	3211	5477	1037	1597	2634	2·5	70·6
14b	31	1¼	64·3	112	2123	3218	5341	894	1604	2498	5·5	66·0
15a	31	3¼	64·2	65	2109	3038	5147	880	1424	2304	3·2	69·4
15b	30	0¾	64·1	68	2005	3262	5267	776	1648	2424	3·5	61·5
16a	33	1½	64·5	101	2254	3384	5638	1025	1770	2795	4·7	66·6
16b	33	3¾	64·6	75	2268	3559	5827	1039	1945	2984	3·4	63·7
17a	34	1	64·3	111	2316	3891	6207	1087	2277	3364	5·1	59·4
17b	33	1½	64·4	112	2259	3858	6117	1030	2244	3274	5·2	58·5
18a	32	1¼	64·0	93	2163	3592	5755	934	1978	2912	4·5	60·2
18b	33	2¼	64·0	95	2243	3779	6022	1014	2165	3179	4·4	59·3
19	29	2¼	63·9	102	1994	3270	5264	765	1656	2421	5·4	61·0
20	..		..	..	..	..	..	..	..	..	..	..
21, 22	..		..	..	..	..	..	..	..	..	..	..

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF

APPENDIX.—TABLE VII.—MANURES and PRODUCE; 7TH SEASON, 1849–50. After the MANURES and SEED (Red Cluster)

Plots.	Manures per Acre.									
	Farm-yard Manure.	Pearl-ash.	Soda-ash.	Sulphate of Magnesia.	Superphosphate of Lime. Bone-ash.	Superphosphate of Lime. Sulphuric Acid (Sp. gr. 1·7).	Superphosphate of Lime. Muriatic Acid.	Sulphate of Ammonia.	Muriate of Ammonia.	Rape Cake.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	..	600	450	..	..	..	..
1	..	600	400	200	..	..	..	..	..	..
2	14	..	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..	..
4	..	..	..	..	200	..	200	300	..	..
5a	..	300	200	100	200	150	..	250	250	..
5b	..	300	200	100	200	150	..	250	250	..
6a	..	300	200	100	200	150	..	200	200	..
6b	..	300	200	100	200	150	..	200	200	..
7a	..	300	200	100	200	150	..	200	200	500
7b	..	300	200	100	200	150	..	200	200	500
8a	..	..	..	..	..	..	..	200	200	..
8b	..	..	..	..	..	..	..	200	200	..
9a	..	..	..	..	..	..	..	200	200	..
9b	..	..	..	..	..	..	..	200	200	..
10a	..	..	..	..	..	..	..	200	200	..
10b	..	300	200	100	200	150	..	..	..	..
11a	..	..	..	..	200	150	..	200	200	..
11b	..	..	..	..	200	150	..	200	200	..
12a	..	300	..	..	200	150	..	200	200	..
12b	..	300	..	..	200	150	..	200	200	..
13a	..	300	..	..	200	150	..	200	200	..
13b	..	300	..	..	200	150	..	200	200	..
14a	..	300	..	..	200	150	..	200	200	..
4b	..	300	..	..	200	150	..	200	200	..
15a	..	300	200	100	200	..	200	300	..	..
5b	..	300	200	100	200	..	200	300	..	500
6a	..	300	200	100	200	150	..	200	200	..
6b	..	300	200	100	200	150	..	200	200	..
17a	..	300	200	100	200	150	..	200	200	..
7b	..	300	200	100	200	150	..	200	200	..
18a	..	300	200	100	200	150	..	200	200	..
8b	..	300	200	100	200	150	..	200	200	..
[illegible]	..	..	..	..	200	..	200	300	..	500
[illegible]	Unmanured		..	..	..	..	..	..	..	..
[illegible]	Mixture of the residue of most of the other manures							..	..	..

WHEAT YEAR AFTER YEAR ON THE SAME LAND.

Harvest of 1849 the Field was Tile-drained in every alternate Furrow, 2 to 3 feet de sown Autumn 1849.

Plots.	Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	19	1½	60·8	42	1220	2037	3257	218	318	536	3·5	59·
1	..	..	..	..	..	..	..	..	..	..	..	..
2	28	2	61·9	98	1861	3245	5106	859	1526	2385	5·4	57·
3	15	3¼	60·6	44	1002	1719	2721	..	..	..	4·5	58·
4	27	3	61·2	87	1785	3312	5097	783	1593	2376	5·1	53·
5*a*	29	3½	60·4	171	1974	4504	6478	972	2785	3757	9·5	43·
5*b*	30	3	60·4	160	2018	4379	6397	1016	2660	3676	8·6	46·
6*a*	30	0½	61·1	119	1960	3927	5887	958	2208	3166	6·3	49·
6*b*	29	3½	61·3	148	1980	3959	5939	978	2240	3218	8·0	50·
7*a*	32	1	61·0	167	2134	4485	6619	1132	2766	3898	8·4	47·
7*b*	32	0¼	61·2	150	2112	4280	6392	1110	2561	3671	7·6	49·
8*a*	28	3	61·1	101	1856	3407	5263	854	1688	2542	5·5	54·
8*b*	30	1	61·0	103	1948	3591	5539	946	1872	2818	5·6	54·
9*a*	30	1½	60·4	118	1951	3550	5501	949	1831	2780	6·3	55·
9*b*	27	2¾	60·8	80	1762	3165	4927	760	1446	2206	4·7	55·
10*a*	26	3¾	60·2	100	1721	3089	4810	719	1370	2089	6·1	55·
10*b*	17	3¾	61·1	76	1171	1949	3120	169	230	399	6·8	60·
11*a*	30	3¼	61·0	121	2001	3806	5807	999	2087	3086	6·4	52·
11*b*	29	1¼	61·1	145	1940	3741	5681	938	2022	2960	8·0	51·
12*a*	29	3¾	61·5	94	1935	3921	5856	933	2202	3135	5·1	49·
12*b*	30	3¾	61·4	115	2013	3905	5918	1011	2186	3197	5·9	51·
13*a*	31	3¾	60·2	105	2027	4026	6053	1025	2307	3332	5·4	50·
13*b*	30	1¼	61·0	111	1964	4008	5972	962	2289	3251	6·0	49·
14*a*	31	1¾	61·1	102	2023	4052	6075	1021	2333	3354	5·3	49·
14*b*	31	1½	61·5	65	1995	4015	6010	993	2296	3289	3·2	49·
15*a*	26	0¼	61·5	90	1693	3321	5014	691	1602	2293	5·7	51·
15*b*	30	3½	61·0	59	1942	3926	5868	940	2207	3147	3·0	49·
16*a*	33	2½	60·3	108	2134	5103	7237	1132	3384	4516	5·3	41·
16*b*	33	3	60·4	122	2159	4615	6774	1157	2896	4053	6·0	46·
17*a*	31	1	61·2	73	1985	4126	6111	983	2407	3390	3·8	48·
17*b*	29	2¼	61·5	139	1961	4034	5995	959	2315	3274	7·7	48·
18*a*	29	3¼	61·2	110	1934	3927	5861	932	2208	3140	6·1	49·
18*b*	28	2½	60·9	103	1845	3844	5689	843	2125	2968	5·7	48·
19	29	0	60·8	88	1850	3527	5377	848	1808	2656	4·9	52·
20	14	0	59·1	40	868	1639	2507	−134	−80	−214	4·5	53·
21, 22	..		..	..	..	..	..	..	..	..	..	..

Experiments at Rothamsted on the Growth of

Appendix.—Table VIII.—Manures and Produce; 8th Season,

Plots.	Manures per Acre.						Superphosphate of Lime.					
	Farm-yard Manure.	Cut Wheat-straw and Chaff.	Common Salt.	Sulphate of Potass.	Soda-ash.	Sulphate of Magnesia.	Bone-ash.	Sulphuric Acid (Sp. gr. 1·7).	Muriatic Acid.	Sulphate of Ammonia.	Muriate of Ammonia.	Rape Cake.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	..	..	..	600	450	..	..	..	..
1	..	..	..	600	400	200	..	..	..	..	..	..
2	14	..	..	..	..	..	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	200	..	200	400	..	..
5a	..	..	..	300	200	100	200	150	..	300	300	..
5b	..	..	..	300	200	100	200	150	..	300	300	..
6a	..	..	..	300	200	100	200	150	..	200	200	..
6b	..	..	..	300	200	100	200	150	..	200	200	..
7a	..	..	..	300	200	100	200	150	..	200	200	1000
7b	..	..	..	300	200	100	200	150	..	200	200	1000
8a	..	5000	..	..	..	..	..	..	..	..	..	..
8b	..	..	..	300	200	100	200	150	..	100	100	..
9a	..	..	..	..	..	..	..	..	..	200	200	..
9b	..	..	..	..	..	..	..	..	..	200	200	..
10a	..	..	..	..	..	..	..	..	..	200	200	..
10b	..	..	..	..	..	..	..	..	..	200	200	..
11a	..	..	..	..	..	..	200	150	..	200	200	..
11b	..	..	..	..	..	..	200	150	..	200	200	..
12a	..	..	..	200	100	..	200	150	..	200	200	..
12b	..	..	..	200	100	..	200	150	..	200	200	..
13a	..	..	..	300	..	..	200	150	..	200	200	..
13b	..	..	..	300	..	..	200	150	..	200	200	..
14a	..	..	..	200	..	100	200	150	..	200	200	..
4b	..	..	..	200	..	100	200	150	..	200	200	..
5a	..	..	..	200	100	100	200	..	200	400	..	..
5b	..	..	..	200	100	100	200	..	200	300	..	500
6a	..	..	336 [1]	200	100	100	200	150	..	300	300	..
6b	..	..	..	200	100	100	200	150	..	300	300	..
7a	..	..	..	200	100	100	200	150	..	200	200	..
7b	..	..	..	200	100	100	200	150	..	200	200	..
8a	..	..	..	..	..	..	..	..	..	200	200	..
8b	..	..	..	..	..	..	..	..	..	200	200	..
9	..	..	..	..	..	..	200	..	200	300	..	500
0	Unmanured		..	..	..	..	..	..	..	..	..	..
'			..	..	..	..	..	..	..	..	..	..
..			..	..	..	..	..	..	..	..	..	..

[1] …or dressed in March 1851.

Wheat Year after Year on the same Land.

1850-51. Manures and Seed (Red Cluster) sown Autumn 1850.

Plots.	Produce per Acre, &c.							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	18	3½	61·9	125	1296	1862	3158	213	235	448	10·7	69·6
1	18	1¼	61·7	124	1251	1845	3096	168	218	386	11·0	67·8
2	29	2¼	63·6	166	2049	3094	5143	966	1467	2433	8·8	66·2
3	15	3¼	61·1	114	1083	1627	2710	..	..	..	11·8	66·6
4	28	0½	62·6	159	1919	2949	4868	836	1322	2158	9·0	65·1
5a	36	0	63·3	194	2473	4131	6604	1390	2504	3894	8·6	59·9
5b	37	3¾	63·3	213	2611	4294	6905	1528	2667	4195	8·9	60·8
6a	33	1¾	63·3	154	2271	3624	5895	1188	1997	3185	7·2	62·6
6b	31	0¼	62·3	189	2119	3507	5626	1036	1880	2916	9·8	60·4
7a	36	3¼	63·0	201	2524	4587	7111	1441	2960	4401	8·7	55·0
7b	37	1½	63·0	178	2532	4302	6834	1449	2675	4124	7·6	58·8
8a	26	0¾	62·8	141	1785	2769	4554	702	1142	1844	8·6	64·5
8b	27	2¼	62·6	137	1863	2830	4693	780	1203	1983	7·9	65·8
9a	31	1½	62·4	182	2142	3252	5394	1059	1625	2684	9·3	65·9
9b	29	0¼	62·0	170	1970	2942	4912	887	1315	2202	9·5	67·0
10a	28	3½	61·9	179	1966	3070	5036	883	1443	2326	10·0	64·0
10b	28	2½	62·5	149	1937	3048	4985	854	1421	2275	8·3	63·5
11a	32	2¾	62·3	181	2216	3386	5602	1133	1759	2892	8·9	65·4
11b	31	2¾	62·5	181	2163	3302	5465	1080	1675	2755	9·1	65·5
12a	32	3	63·1	165	2234	3600	5834	1151	1973	3124	8·0	62·0
12b	32	2¼	62·5	166	2203	3581	5784	1120	1954	3074	8·2	61·5
13a	30	2¾	62·6	180	2102	3544	5646	1019	1917	2936	9·4	59·3
13b	30	3¼	62·3	160	2083	3440	5523	1000	1813	2813	8·3	60·5
14a	31	0¼	62·9	168	2120	3605	5725	1037	1978	3015	8·6	58·8
14b	31	0½	62·8	165	2121	3537	5658	1038	1910	2948	8·4	59·9
15a	27	0½	62·7	138	1839	3041	4880	756	1414	2170	8·1	60·5
15b	30	2½	6 9	148	2077	3432	5509	994	1805	2799	7·6	60·5
16a	36	3¼	63·5	161	2499	4234	6733	1416	2607	4023	6·9	59·0
16b	36	2¾	63·4	176	2501	4332	6833	1418	2705	4123	7·6	57·7
17a	31	3½	63·3	131	2149	3597	5746	1066	1970	3036	6·5	59·7
17b	30	2¼	63·1	152	2079	3406	5485	996	1779	2775	7·9	61·0
18a	30	3¼	63·0	139	2083	3390	5473	1000	1763	2763	7·2	64·1
18b	31	0¾	62·4	143	2090	3586	5676	1007	1959	2966	7·3	58·3
19	30	1	62·4	144	2031	3348	5379	948	1721	2669	7·7	60·7
20	14	1	60·8	89	956	1609	2565	−127	− 18	−145	10·2	59·4
21 } 22 }	17	3½	61·9	127	1232	1763	2995	149	136	285	11·5	69·9

EXPERIMENTS AT ROTHAMSTED ON THE GROWT
ON THE SAME LA

APPENDIX.—TABLE IX.—MANURES per Acre per A
in the Notes on p. 163), for 12 Years in successi
12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th,
crops of Harvests 1852–53–54–55–56–57–58–59–

Plots.	Manures per Acre per Annum for 12 Years, 1851-2 to 18 the Notes on p						
	Farm-yard Manure.	Common Salt.	Sulphate of Potass.[1]	Sulphate of Soda.[1]	Sulphate of Magnesia.[1]	Superphospha	
						Bone-ash.	Sulphu Aci (Sp. gr.
	Tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	..	..	..	..	..	600	45
1	..	..	600	400	200	..	..
2	14	..	..	..	..	..	..
3	Unmanured		..	..	..	..	..
4	Unmanured		..	..	..	..	..
5a	..	..	300	200	100	200	15
5b	..	..	300	200	100	200	15
6a	..	..	300	200	100	200	15
6b	..	..	300	200	100	200	15
7a	..	..	300	200	100	200	15
7b	..	..	300	200	100	200	15
8a	..	..	300	200	100	200	15
8b	..	..	300	200	100	200	15
9a[2]	..	..	300	200	100	200	15
9b[3]	..	..	..	..	..	..	..
10a	..	..	..	..	..	..	..
10b	..	..	..	..	..	..	..
11a	..	..	..	..	..	200	15
11b	..	..	..	..	..	200	15
12a	..	..	..	550	..	200	15
12b	..	..	..	550	..	200	15
13a	..	..	300	..	..	200	15
13b	..	..	300	..	..	200	15
14a	..	..	..	..	420	200	15
14b	..	..	..	..	420	200	15
15a	..	..	300	200	100	200	..
15b	..	..	300	200	100	200	..
16a	..	336[4]	300	200	100	200	15
16b	..	..	300	200	100	200	15
5 {17a	..	..	..	..	..	..	..
{17b	..	..	..	..	..	..	..
5 {18a	..	..	300	200	100	200	15
{18b	..	..	300	200	100	200	15
19	..	..	..	..	..	200	..
20	Unmanured		..	..	..	..	..
21	..	..	300	200	100	..	..
22	..	..	300	200	100	..	..

* For the particulars of the produce of each separate season, se
sive years collectively, Tables XXII.-XXVI. inclusive.

NOTES TO TABLE IX. (p. 162.)

[TABLE IX. is intended to be drawn out to the left, free of the book, as it has reference to the succeeding Tables.]

[1] *For the* 16*th and succeeding seasons*—the sulphate of potass was reduced from 600 to 400 lbs. per acre per annum on Plot 1, and from 300 to 200 lbs. on all the other Plots where it was used; the sulphate of soda from 400 to 200 lbs. on Plot 1, to 100 lbs. on all the Plots on which 200 lbs. had previously been applied, and from 550 to 336½ lbs. (two-thirds the amount) on Plots 12*a* and 12*b*; and the sulphate of magnesia from 420 to 280 lbs. (two-thirds the amount) on Plots 14*a* and 14*b*.

[2] *Plot* 9*a*—the sulphates of potass, soda, and magnesia, and the superphosphate of lime, were applied in the 12th and succeeding seasons, but not in the 9th, 10th, and 11th; and the amount of nitrate of soda was for the 9th season only 475 lbs. per acre, and for the 10th and 11th seasons only 275 lbs.

[3] *Plot* 9*b*—in the 9th season only 475 lbs. of nitrate of soda were applied.

[4] *Common salt*—not applied after the 10th season.

[5] *Plots* 17*a and* 17*b*, *and* 18*a and* 18*b*—the manures on these plots alternate: that is, Plots 17 were manured with ammonia-salts in the 9th season; with the sulphates of potass, soda, and magnesia, and superphosphate of lime, in the 10th; ammonia-salts again in the 11th; the sulphates of potass, soda, and magnesia, and superphosphate of lime, again in the 12th, and so on. Plots 18, on the other hand, had the sulphates of potass, soda, and magnesia, and superphosphate of lime, in the 9th season; ammonia-salts in the 10th, and so on, alternately.

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTE ON THE SAME LAND.

APPENDIX.—TABLE X.—PRODUCE of the 9TH SEASON, 1851-2. SEED (Red C sown November 7, 1851; Crop cut August 24, 1852.

Plots.	PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163).								INCREASE PER ACRE BY MANURE.			Offal Corn to 100 Dress
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).		Corn.	Straw and Chaff.	Total Produce.	
	Quantity.		Weight per Bushel.									
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	
0	15	0¾	55·8	72	919	1706	2625		59	109	168	8·
1	13	1	56·9	71½	825	1497	2322		− 35	−100	−135	9·
2	27	2¼	58·2	112½	1716	3457	5173		856	1860	2716	7·
3	13	3¾	56·6	78	860	1597	2457		..	..	..	9·
4	13	1¼	57·3	106¼	870	1571	2441		10	− 26	− 16	13·
5a	16	3	57·5	72½	1038	1903	2941		178	306	484	7·
5b	17	0¼	57·3	86¼	1065	2032	3097		205	435	640	8·
6a	20	3	57·6	95½	1288	2581	3869		428	984	1412	8·
6b	20	3½	57·5	101¾	1300	2604	3904		440	1007	1447	8·
7a	26	2¼	56·0	126¾	1615	3850	5465		755	2253	3008	8·
7b	26	3¾	55·8	139¼	1643	3772	5415		783	2175	2958	9·
8a	27	3½	55·9	140½	1699	3806	5505		839	2209	3048	9·
8b	27	0½	55·9	133½	1651	3772	5423		791	2175	2966	8·
9a	25	2	55·6	171¾	1591	3714	5305		731	2117	2848	12·
9b	24	1¾	55·3	153	1509	3374	4883		649	1777	2426	11·
10a	21	3½	55·9	97½	1320	2787	4107		460	1190	1650	8·
10b	22	0¼	57·3	80	1343	2819	4162		483	1222	1705	6·
11a	24	0¾	55·6	128	1472	3081	4553		612	1484	2096	9·
11b	22	1½	55·9	133½	1387	2912	4299		527	1315	1842	10·
12a	24	1¾	57·4	100¾	1503	3257	4760		643	1660	2303	7·
12b	24	1¼	57·3	101¾	1492	3232	4724		632	1635	2267	7·
13a	24	0	57·5	100¾	1480	3222	4702		620	1625	2245	7·
13b	23	3¾	57·1	106¾	1476	3289	4765		616	1692	2308	7·
14a	24	1¾	56·9	114¼	1507	3547	5054		647	1950	2597	8·
14b	25	0¼	56·7	107	1530	3607	5137		670	2010	2680	7·
15a	23	1½	57·4	111¾	1451	3212	4663		591	1615	2206	8·
15b	25	0½	56·8	90¾	1520	3421	4941		660	1824	2484	6·
16a	28	3½	55·0	204½	1794	4677	6471		934	3080	4014	12·
16b	28	0	54·5	175	1700	4616	6316		840	3019	3859	11·
17a	25	2	56·5	135½	1577	3734	5311		717	2137	2854	9·
17b	24	1½	56·9	132	1520	3466	4986		660	1869	2529	9·
18a	13	3	57·0	86¼	869	1687	2556		9	90	99	11·
18b	14	3¾	56·7	75	921	1764	2685		61	167	228	8·
19	24	3¾	56·1	183¼	1582	3397	4979		722	1800	2522	13·
20	14	0¾	56·6	71	875	1577	2452		15	−20	− 5	8·
21	19	1¾	56·9	68¼	1177	2108	3285		317	511	828	6·
22	19	2¼	55·9	82½	1176	2179	3355		316	582	898	7·

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR ON THE SAME LAND.

APPENDIX.—TABLE XI.—PRODUCE of the 10TH SEASON, 1853. SEED (F
sown March 16; Crop cut September 10, and carted September 20,

Plots.	PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163). Dressed Corn. Quantity.		Weight per Bushel.	Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	INCREASE PER ACRE BY MANURE. Corn.	Straw and Chaff.	Total Produce.
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	9	0¾	49·1	142½	599	1807	2406	240	394	634
1	6	1¾	46·1	100¾	404	1632	2036	45	219	264
2	19	0½	51·1	143	1120	3372	4492	761	1959	2720
3	5	3¼	45·1	93	359	1413	1772	..	..	..
4	7	1	46·1	107	446	1670	2116	87	257	344
5a	10	0	48·9	99¾	587	1951	2538	228	538	766
5b	10	1	48·9	111¾	611	2130	2741	252	717	969
6a	16	3¼	51·8	112¾	978	2777	3755	619	1364	1983
6b	19	1	51·8	80½	1072	2798	3870	713	1385	2098
7a	23	2½	52·2	139	1369	3741	5110	1010	2328	3338
7b	23	2¼	51·1	132½	1357	3734	5091	998	2321	3319
8a	22	1¼	51·1	191¾	1346	3966	5312	987	2553	3540
8b	24	2¼	51·1	150¾	1425	3927	5352	1066	2514	3580
9a	11	1	47·7	155½	691	2399	3090	332	986	1318
9b	10	1¾	46·1	158¼	649	2253	2902	290	840	1130
10a	9	3¾	48·9	159¾	642	2049	2691	283	636	919
10b	15	2	49·8	127¼	896	2682	3578	537	1269	1806
11a	17	2	50·1	127¾	1015	2524	3539	656	1111	1767
11b	18	2¾	51·1	117	1073	2707	3780	714	1294	2008
12a	22	0	52·0	137¾	1283	3665	4948	924	2252	3176
12b	23	3¼	51·1	140¼	1375	3704	5079	1016	2291	3307
13a	22	1¼	52·1	179	1341	3704	5045	982	2291	3273
13b	23	2½	51·1	169	1396	3912	5308	1037	2499	3536
14a	21	2	51·2	203¼	1322	3471	4793	963	2058	3021
14b	23	0¾	52·6	132¾	1347	3761	5108	988	2348	3336
15a	19	0	51·1	161¾	1143	3361	4504	784	1948	2732
15b	23	2½	51·1	130½	1351	3756	5107	992	2343	3335
16a	24	1½	52·5	220	1496	4904	6400	1137	3491	4628
16b	25	3¼	52·5	186¾	1537	5019	6556	1178	3606	4784
17a	8	1¾	49·8	101¾	520	1996	2516	161	583	744
17b	8	3¾	48·9	102½	539	2012	2551	180	599	779
18a	17	3¼	52·9	175	1111	3385	4496	752	1972	2724
18b	20	3	52·1	163¾	1256	3796	5052	897	2383	3280
19	19	1¼	52·6	147½	1160	3213	4373	801	1800	2601
20	5	3¼	47·8	150	425	1659	2084	66	246	312
21	12	3¾	50·4	101¾	753	2181	2934	394	768	1162
22	10	1	49·4	86	592	1860	2452	233	447	680

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER Y ON THE SAME LAND.

APPENDIX.—TABLE XII,—PRODUCE of the 11TH SEASON, 1853-4. SEED (Red Rosto sown November 12, 1853; Crop cut August 21, and carted August 31, 1854.

Plots.	PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163).								INCREASE PER ACRE PER MANURE.			Offal Corn to 100 Dressed.	Co t 1 Str
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).		Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.										
	Bush.	Pks.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.		
0	26	1¾	61·0	59¾	1672	2114	3786		313	−23	290	3·7	[illegible]
1	24	1½	60·2	59¼	1529	2531	4060		170	394	564	4·0	[illegible]
2	41	0½	62·5	103¾	2675	4450	7125		1316	2313	3629	4·0	[illegible]
3	21	0¼	60·6	82	1359	2137	3496		..	..	..	6·4	[illegible]
4	23	3½	61·1	61¾	1521	2338	3859		162	201	363	4·2	[illegible]
5a	24	1½	61·0	91¼	1578	2520	4098		219	383	602	6·1	[illegible]
5b	24	0	61·6	53	1532	2503	4035		173	366	539	3·6	[illegible]
6a	33	2¾	61·8	103¼	2186	3845	6031		827	1708	2535	5·0	[illegible]
6b	34	2¼	61·8	100½	2239	4055	6294		880	1918	2798	4·7	[illegible]
7a	45	2¼	61·9	131½	2950	5603	8553		1591	3466	5057	4·7	[illegible]
7b	45	1½	61·8	140¼	2944	5496	8440		1585	3359	4944	5·0	[illegible]
8a	47	1¾	61·4	152¾	3065	6135	9200		1706	3998	5704	5·3	[illegible]
8b	49	2½	61·8	139½	3208	6117	9325		1849	3980	5829	4·6	[illegible]
9a	38	3	60·7	103½	2456	4142	6598		1097	2005	3102	4·4	[illegible]
9b	38	3½	60·7	118¼	2480	4243	6723		1121	2106	3227	5·0	[illegible]
10a	34	1½	60·5	131½	2211	3597	5808		852	1460	2312	6·3	61
10b	39	0¾	61·6	121¼	2535	4468	7003		1176	2331	3507	5·0	56
11a	44	2	61·1	140¼	2859	5147	8006		1500	3010	4510	5·2	55
11b	43	0½	61·2	117½	2756	5020	7776		1397	2883	4280	4·5	54
12a	45	3¼	62·2	114¼	2966	5503	8469		1607	3366	4973	4·0	53
12b	45	1½	62·2	115	2939	5473	8412		1580	3336	4916	4·1	53
13a	45	0½	62·2	106	2913	5398	8311		1554	3261	4815	3·8	54
13b	43	3½	62·2	130¼	2858	5545	8403		1499	3408	4907	4·3	51
14a	45	1¼	62·2	127¾	2946	5552	8498		1587	3415	5002	4·5	53
14b	44	0½	62·2	120¼	2863	5418	8281		1504	3281	4785	4·4	52
15a	43	1¼	62·1	111¼	2801	4898	7699		1442	2761	4203	4·1	57
15b	43	1	62·4	112½	2810	5273	8083		1451	3136	4587	4·2	53
16a	49	2¼	61·7	173¼	3230	6702	9932		1971	4565	6536	5·7	48
16b	50	0¾	61·7	196¼	3293	6635	9928		1934	4498	6432	6·3	49
17a	45	3	62·1	104	2948	5270	8218		1589	3133	4722	3·7	55
17b	42	2¼	62·2	86½	2732	4897	7629		1373	2760	4133	3·3	55
18a	24	0	61·2	55†	1526	2418	3944		167	281	448	3·8	63
18b	23	2¾	61·0	64½	1511	2377	3888		152	240	392	4·5	63
19	41	0¾	61·7	122½	2666	4677	7343		1307	2540	3847	4·8	57
20	22	3	60·8	62	1445	2217	3662		86	80	166	4·5	[illegible]
21	32	0½	61·2	63¾	2030	3440	5470		671	1303	1974	3·3	[illegible]
22	31	3	61·0	55¼	1994	3340	5334		635	1203	1838	2·9	[illegible]

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

APPENDIX.—TABLE XIII.—PRODUCE of the 12TH SEASON, 1854-5. SEED (Red Rostock) sown November 9,1854; Crop cut August 26, and carted September 2, 1855.

Plots.	PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163). Dressed Corn. Quantity.		Weight per Bushel.	Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw)	INCREASE PER ACRE BY MANURE. Corn.	Straw and Chaff.	Total Produce.	Offal Corn to 100 Dressed.	Corn to 100 Straw.
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	17	0	60·7	63	1096	1726	2822	24	− 61	− 37	6·1	63·5
1	18	2	60·5	57½	1179	1890	3069	107	103	210	5·1	62·4
2	34	2½	62·0	88¼	2237	3845	6082	1165	2058	3223	4·1	58·2
3	17	0	59·2	65¾	1072	1787	2859	..	..	..	6·5	60·0
4	18	2½	59·5	57¾	1168	1832	3000	96	45	141	5·2	63·8
5a	18	2	59·9	46½	1157	1819	2976	85	32	117	4·2	63·6
5b	18	0½	60·1	51½	1143	1800	2943	71	13	84	4·7	63·5
6a	27	3	60·3	80¾	1753	2837	4590	681	1050	1731	4·8	61·8
6b	28	1	60·9	87¾	1811	3037	4848	739	1250	1989	5·1	59·6
7a	32	2¾	59·4	142	2084	3911	5995	1012	2124	3136	7·3	53·3
7b	33	1¼	59·5	154	2138	4158	6296	1066	2371	3437	7·8	51·4
8a	29	3	58·6	160	1909	3838	5747	837	2051	2888	9·2	49·7
8b	33	0¾	58·7	205	2153	4342	6495	1081	2555	3636	10·5	49·6
9a	29	2½	58·3	203¾	1932	3946	5878	860	2159	3019	11·8	49·0
9b	25	1½	57·3	152½	1605	3212	4817	533	1425	1958	10·5	50·0
10a	19	3¾	57·1	145	1285	2512	3797	213	725	938	12·7	51·2
10b	28	0½	58·9	145	1805	3268	5073	733	1481	2214	8·7	55·2
11a	18	3	55·3	174	1210	2484	3694	138	697	835	16·8	48·7
11b	24	2½	56·3	193¾	1580	3153	4733	508	1366	1874	14·0	50·1
12a	30	0¾	59·5	151¼	1940	3538	5478	868	1751	2619	8·5	54·8
12b	33	2	60·2	157	2172	4010	6182	1100	2223	3323	7·8	54·2
13a	29	0	59·9	187¾	1924	3503	5427	852	1716	2568	10·8	54·9
13b	32	2	60·4	147¾	2110	3870	5980	1038	2083	3121	7·5	54·5
14a	29	3	60·0	167¾	1954	3577	5531	882	1790	2672	9·4	54·6
14b	33	1¾	60·0	148¾	2158	4003	6161	1086	2216	3302	7·4	53·9
15a	31	3¼	60·0	119½	2030	3825	5855	958	2038	2996	6·3	53·1
15b	33	3	60·6	146½	2193	4222	6415	1121	2435	3556	7·2	52·0
16a	33	1¼	58·2	160	2100	4534	6634	1028	2747	3775	8·3	46·3
16b	32	2	58·2	225¾	2115	4991	7106	1043	3204	4247	12·0	42·4
17a	18	3¾	60·8	78¼	1227	1976	3203	155	189	344	6·8	62·1
17b	17	0½	60·3	77¾	1110	1804	2914	38	17	55	7·5	61·5
18a	32	3¾	60·9	122¾	2127	4017	6144	1055	2230	3285	6·1	52·9
18b	33	1¾	60·8	135¾	2170	4215	6385	1098	2428	3526	6·7	51·5
19	30	0½	58·7	195¾	1967	3851	5818	895	2064	2959	11·1	51·1
20	17	2¼	61·1	76¼	1155	1831	2986	83	44	127	7·1	63·1
21	24	1¾	60·8	47	1533	2419	3952	461	632	1093	3·2	63·4
22	24	2½	60·1	70¾	1553	2457	4010	481	670	1151	4·8	63·2

Experiments at Rothamsted on the Growth of Wheat Year a[fter year]
on the same Land.

Appendix.—Table XIV.—Produce of the 13th Season, 1855-6. Seed (R[ed] ...) sown November 13, 1855; Crop cut August 26, and carted September ...

Plots.	Produce per Acre, &c. (For the Manures see pp. 162 and 163). Dressed Corn. Quantity.		Weight per Bushel.	Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Increase per Acre by Manure. Corn.	Straw and Chaff.	Total Produce.	D
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
0	18	1½	56·8	132½	1179	1969	3148	287	411	698	
1	17	0¾	56·3	135½	1102	1933	3035	210	375	585	
2	36	1¼	58·6	150	2277	4317	6594	1385	2759	4144	
3	14	2	54·3	103¼	892	1558	2450	..	..	..	
4	16	1½	55·5	115¾	1026	1731	2757	134	173	307	
5a	18	3¼	56·5	104¾	1167	2012	3179	275	454	729	
5b	20	1¼	56·2	106¾	1247	2122	3369	355	564	919	
6a	27	1¼	58·2	128½	1717	3050	4767	825	1492	2317	
6b	28	0½	58·5	110¾	1755	3093	4848	863	1535	2398	
7a	37	1	58·0	152¼	2312	4560	6872	1420	3002	4422	
7b	36	2¼	57·6	140¾	2244	4398	6642	1352	2840	4192	
8a	40	0½	56·8	228¼	2507	5182	7689	1615	3624	5239	
8b	37	3¾	57·1	230¾	2400	5089	7489	1508	3531	5039	
9a	32	1½	57·2	166¼	2019	3875	5894	1127	2317	3444	
9b	26	0	56·8	214¼	1679	3152	4831	787	1594	2381	
10a	24	0¾	55·6	162½	1505	2818	4323	613	1260	1873	
10b	27	2¾	57·2	145	1727	3168	4895	835	1610	2445	
11a	31	3½	57·3	173¼	2001	3517	5518	1109	1959	3068	
11b	30	2½	57·5	183¾	1946	3443	5389	1054	1885	2939	
12a	33	3½	58·7	111¾	2102	3847	5949	1210	2289	3499	
12b	32	3½	58·8	145¾	2079	3725	5804	1187	2167	3354	
13a	32	1¾	58·6	138	2036	3743	5779	1144	2185	3329	
13b	30	3¼	58·9	193	2008	3651	5659	1116	2093	3209	
14a	35	0½	58·6	140½	2195	4202	6397	1303	2644	3947	
14b	34	0¾	59·0	145	2162	4117	6279	1270	2559	3829	
15a	30	0½	59·1	142¼	1923	3521	5444	1031	1963	2994	
15b	32	0	59·4	143¼	2045	3752	5797	1153	2194	3347	
16a	38	0½	58·5	195¾	2426	5529	7955	1534	3971	5505	
16b	37	3	58·7	232½	2450	5467	7917	1558	3909	5467	
17a	31	2½	59·0	116¾	1983	3558	5541	1091	2000	3091	
17b	30	1¾	59·1	137½	1935	3465	5400	1043	1907	2950	
18a	17	3½	57·8	107	1140	2012	3152	248	454	702	
18b	18	0	57·7	93¼	1131	1938	3069	239	380	619	
19	32	1	58·9	157½	2059	3562	5621	1167	2004	3171	
20	17	0¾	57·7	83½	1075	1888	2963	183	330	513	
21	22	1½	58·0	98	1398	2529	3927	506	971	1477	
22	21	1¾	57·8	109¼	1351	2498	3849	459	940	1399	

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

APPENDIX.—TABLE XV.—PRODUCE of the 14TH SEASON, 1856-7. SEED (Red Rostock) sown November 6, 1856. Crop cut August 13, and carted August 22, 1857.

Plots.	PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163).							INCREASE PER ACRE BY MANURE.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
	Quantity.		Weight per Bushel.									
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
0	18	2¼	59·0	86¼	1181	1545	2726	− 55	− 32	− 87	7·9	76·5
1	17	2¼	59·0	76	1118	1532	2650	−118	− 45	−163	7·3	73·0
2	41	0¾	60·4	98¼	2587	3323	5910	1351	1746	3097	4·0	77·9
3	19	3¾	58·3	74½	1236	1577	2813	..	..	..	6·4	78·3
4	22	1¾	58·8	67½	1386	1572	2958	150	− 5	145	5·1	88·2
5a	22	3¾	59·0	56¾	1409	1617	3026	173	40	213	4·2	87·2
5b	24	2¼	58·8	66¾	1512	1735	3247	276	158	434	4·6	87·1
6a	35	1½	59·9	92½	2211	2757	4968	975	1180	2155	4·4	80·2
6b	35	1¼	59·8	78¼	2193	2757	4950	957	1180	2137	3·7	79·6
7a	43	1¼	60·5	160½	2782	3680	6462	1546	2103	3649	6·1	75·6
7b	46	1½	60·3	108¼	2902	3891	6793	1666	2314	3980	3·9	74·6
8a	47	3	60·8	158¼	3058	4297	7355	1822	2720	4542	5·5	71·2
8b	48	3¼	60·6	169¼	3129	4450	7579	1893	2873	4766	5·7	70·3
9a	43	3	60·1	135	2767	3867	6634	1531	2290	3821	5·1	71·6
9b	36	0¾	58·0	121¾	2220	2983	5203	984	1406	2390	5·8	74·4
10a	29	0½	58·0	125¾	1816	2392	4208	580	815	1395	7·4	75·9
10b	34	2	58·6	163¼	2185	2875	5060	949	1298	2247	8·1	76·0
11a	39	0	58·5	150	2432	2943	5375	1196	1366	2562	6·6	82·6
11b	39	0¾	58·0	121¾	2397	2920	5317	1161	1343	2504	5·4	82·1
12a	43	3½	60·4	100	2747	3647	6394	1511	2070	3581	3·8	75·8
12b	43	2	60·4	104¼	2729	3583	6312	1493	2006	3499	4·0	76·2
13a	42	3	60·6	122½	2714	3707	6421	1478	2130	3608	4·7	73·2
13b	43	2	60·5	108¼	2739	3647	6386	1503	2070	3573	4·1	75·1
14a	43	3	60·5	134¼	2781	3658	6439	1545	2081	3626	5·1	76·0
14b	42	3½	60·3	113½	2699	3652	6351	1463	2075	3538	4·4	73·9
15a	42	1¼	60·4	125¾	2681	3687	6368	1445	2110	3555	4·9	72·7
15b	44	1¾	60·0	96¾	2765	3778	6543	1529	2201	3730	3·6	73·2
16a	48	3¼	60·5	175	3131	4683	7814	1895	3106	5001	5·9	66·9
16b	50	0	60·5	169½	3194	4703	7897	1958	3126	5084	5·6	67·9
17a	26	2¾	59·1	66¾	1642	2058	3700	406	481	887	4·2	79·8
17b	25	3¾	58·8	59¼	1583	1940	3523	347	363	710	3·9	81·6
18a	41	0½	59·7	114½	2566	3443	6009	1330	1866	3196	4·7	74·5
18b	40	0¼	59·8	124¼	2519	3365	5884	1283	1788	3071	5·2	74·9
19	41	2½	59·5	123¼	2600	3193	5793	1364	1616	2980	5·0	81·4
20	19	2¾	58·4	62¾	1213	1564	2777	− 23	− 13	− 36	5·5	77·6
21	24	0	60·6	81¾	1538	1815	3353	302	238	540	5·6	84·8
22	23	0½	60·6	87½	1491	1807	3298	255	230	485	6·2	82·5

Experiments at Rothamsted on the Growth of Wheat Year after on the same Land.

Appendix.—Table XVI.—Produce of the 15th Season, 1857-8. Seed (Red B
sown November 3 and 11, 1857; Crop cut August 9, and carted August 20, 1

Plots.	Produce per Acre, &c. (For the Manures see pp. 162 and 163).							Increase per Acre by Manure.			Offal Corn to 100 Dressed.
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.	
	Quantity.		Weight per Bushel.								
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
0	20	3	61·2	61¼	1332	1902	3234	191	232	423	4·8
1	16	1¼	60·7	64½	1055	1630	2685	– 86	– 40	–126	6·5
2	38	3½	62·6	82½	2512	3837	6349	1871	2167	3538	3·4
3	18	0	60·4	52	1141	1670	2811	..	...	..	4·8
4	19	0½	61·1	36¾	1206	1673	2879	65	3	68	3·1
5a	18	2¾	61·5	35	1187	1532	2719	46	–138	– 92	3·0
5b	19	1	61·4	45	1227	1643	2870	86	– 27	59	3·8
6a	28	2¼	62·1	41¾	1818	2577	4395	677	907	1584	2·3
6b	29	0½	62·1	38¼	1850	2713	4563	709	1043	1752	2·1
7a	38	2¼	61·9	65	2450	3965	6415	1309	2295	3604	2·7
7b	39	2¼	62·3	68	2530	4092	6622	1389	2422	3811	2·8
8a	41	3¾	61·8	86¾	2680	4667	7347	1539	2997	4536	3·3
8b	41	3¼	61·7	94½	2675	4667	7342	1534	2997	4531	3·7
9a	37	2¼	60·8	100	2384	4317	6701	1243	2647	3890	4·4
9b	23	2	58·8	88	1470	2688	4158	329	1018	1347	6·4
10a	22	3½	59·6	75¾	1439	2130	3569	298	460	758	5·6
10b	27	3	61·4	70½	1775	2615	4390	634	945	1579	4·1
11a	30	3½	60·5	108¾	1977	2797	4774	836	1127	1963	5·8
11b	33	0¼	60·4	104	2099	3018	5117	958	1348	2306	5·2
•12a	37	3¾	62·1	78¾	2437	3663	6100	1296	1993	3289	3·3
12b	37	0¾	62·1	76¼	2387	3673	6060	1246	2003	3249	3·3
13a	37	0¾	62·1	72	2384	3693	6077	1243	2023	3266	3·1
13b	37	0¾	62·7	66¾	2397	3677	6074	1256	2007	3263	2·9
14a	37	3¼	62·1	65¾	2413	3737	6150	1272	2067	3339	2·8
14b	38	1¼	62·0	61¼	2436	3710	6146	1295	2040	3335	2·6
15a	35	1½	62·6	70¾	2285	3515	5800	1144	1845	2989	3·2
15b	37	2	62·8	81¾	2436	3698	6134	1295	2028	3323	3·5
16a	41	3	62·1	106¾	2702	4797	7499	1561	3127	4688	4·1
16b	42	0½	62·1	99½	2717	4813	7530	1576	3143	4719	3·8
17a	33	1¼	62·5	66¾	2150	3203	5353	1009	1533	2542	3·2
17b	33	3¼	62·5	65¾	2181	3274	5455	1040	1604	2644	3·1
18a	22	3¾	62·3	41¾	1472	2008	3480	331	338	669	2·9
18b	20	2¾	62·4	49¼	1338	1967	3305	197	297	494	3·8
19	33	1¼	62·5	93¼	2177	3185	5362	1036	1515	2551	4·5
20	17	0	60·3	63½	1089	1730	2819	– 52	60	8	6·2
21	24	1¾	61·5	70¼	1574	2373	3947	433	703	1136	4·8
22	22	0	61·5	58¼	1412	2180	3592	271	510	781	4·3

MENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

DIX.—TABLE XVII.—PRODUCE of the 16TH SEASON, 1858-9. SEED (Red Ros-:) sown November 4, 1858 Crop cut August 4, and carted August 20, 1859.

Produce per Acre, &c. (For the Manures see pp. 162 and 163).							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
Quantity.		Weight per Bushel.									
Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
21	2¼	54·0	88¾	1254	2310	3564	203	135	338	7·6	54·3
19	3	55·0	101	1189	2300	3489	138	125	263	9·3	51·7
36	0¾	56·5	218¼	2263	4810	7073	1212	2635	3847	10·7	47·1
18	1¼	52·5	88¼	1051	2175	3226	..	..	..	9·2	48·3
19	0¾	55·0	131¾	1188	2230	3418	137	55	192	12·5	53·3
20	2¼	56·0	123¾	1277	2323	3600	226	148	374	10·7	55·0
20	2½	56·0	118¼	1273	2393	3666	222	218	440	10·2	53·2
29	2½	56·5	133¼	1808	3747	5555	757	1572	2329	8·0	48·3
30	0½	56·5	153¼	1855	3853	5708	804	1678	2482	9·0	48·1
34	2¾	55·9	158¼	2097	4677	6774	1046	2502	3548	8·2	44·9
34	2½	55·9	155	2089	4803	6892	1038	2628	3666	8·0	43·5
34	3¼	54·0	186¾	2068	5353	7421	1017	3178	4195	9·9	38·6
34	0¼	53·4	181¾	2007	5597	7604	956	3422	4378	10·0	35·9
30	0	54·5	170¾	1806	5270	7076	755	3095	3850	10·5	34·3
24	2¼	50·5	170	1412	3590	5002	361	1415	1776	13·7	39·3
18	3¾	51·5	230	1207	2730	3937	156	555	711	23·5	44·2
25	2	52·5	160	1500	3420	4920	449	1245	1694	11·9	43·9
26	3½	51·4	248¼	1628	3527	5155	577	1352	1929	18·0	46·2
27	3¼	51·3	274¼	1698	3577	5275	647	1402	2049	19·3	47·5
34	2½	54·5	170¾	2060	4550	6610	1009	2375	3384	9·0	45·3
34	3½	54·8	206¾	2115	4743	6858	1064	2568	3632	10·9	44·6
34	0¾	55·0	155¾	2037	4737	6774	986	2562	3548	8·3	43·0
34	3½	55·0	168¼	2087	4807	6894	1036	2632	3668	8·8	43·4
34	1¾	54·5	175¾	2054	4763	6817	1003	2588	3591	9·4	43·1
34	2¼	54·5	188¾	2074	4700	6774	1023	2525	3548	10·0	44·1
34	0¾	55·0	171¾	2053	4773	6826	1002	2598	3600	9·1	43·0
35	0¼	55·0	165	2095	4993	7088	1044	2818	3862	8·6	42·0
34	3¾	52·6	189¼	2026	5927	7953	975	3752	4727	10·3	34·2
34	1¾	52·6	193	2005	5793	7798	954	3618	4572	10·7	34·6
21	1¼	55·0	73¼	1247	2483	3730	196	308	504	6·3	50·2
19	3	54·5	90	1168	2373	3541	117	198	315	8·3	49·2
32	3¼	55·5	153¼	1973	4533	6506	922	2358	3280	8·4	43·5
32	2	56·0	158¼	1980	4650	6630	929	2475	3404	8·7	42·6
30	2	55·5	211¾	1903	4023	5926	852	1848	2700	12·5	47·3
17	3¼	52·5	102¾	1039	2217	3256	−12	42	30	11·0	46·9
26	1½	54·0	115½	1538	3185	4723	487	1010	1497	8·1	48·3
24	0¾	55·0	130	1460	2980	4440	409	805	1214	9·8	49·0

Experiments at Rothamsted on the Growth of Wheat Year aft[er Year] on the same Land.

Appendix.—Table XVIII.—Produce of the 17th Season, 1859-60. Se[...] Rostock) sown November 17, 1859; Crop cut September 17 and 19, an[d] October 5, 1860.

Plots.	Produce per Acre, &c. (For the Manures see pp. 162 and 163).								Increase per Acre by Manure.			Off[al] Co[rn] t[o] 10[0] Dres[sed].
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).		Corn.	Straw and Chaff.	Total Produce.	
	Quantity.		Weight per Bushel.									
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	
0	14	1¼	53·5	61¼	826	1445	2271		88	−14	74	8·
1	12	1¾	52·8	61	717	1380	2097		−21	−79	−100	9·
2	32	1¼	55·5	72½	1864	3440	5304		1126	1981	3107	4·
3	12	3½	52·6	62½	738	1459	2197		..	..	..	9·
4	14	2	53·0	73¼	832	1520	2352		94	61	155	9·
5a	15	2¾	54·0	56¾	903	1580	2483		165	121	286	6·
5b	16	0½	53·1	78	935	1660	2595		197	201	398	9·
6a	21	0½	53·7	76¾	1210	2183	3393		472	724	1196	6·
6b	22	3¼	54·2	88½	1326	2393	3719		588	934	1522	7·
7a	27	3½	54·3	98¼	1612	3003	4615		874	1544	2418	6·
7b	27	2¼	54·3	102	1597	3137	4734		859	1678	2537	6·
8a	30	3	52·8	133½	1759	3880	5639		1021	2421	3442	8·
8b	31	2¾	52·3	129¼	1787	3813	5600		1049	2354	3403	7·
9a	32	2½	51·5	176¾	1858	4777	6635		1120	3318	4438	10·
9b	19	2¼	48·5	205	1155	3130	4285		417	1671	2088	21·
10a	15	0½	49·5	155	905	2213	3118		167	754	921	20·
10b	18	2½	51·0	111¾	1060	2360	3420		322	901	1223	11·
11a	22	1¼	51·0	128¼	1270	2503	3773		532	1044	1576	11·
11b	22	1½	51·2	161¾	1307	2693	4000		569	1234	1803	14·
12a	28	0½	53·4	146¾	1648	3230	4878		910	1771	2681	9·
12b	26	2¼	53·5	155	1577	3087	4664		839	1628	2467	10·
13a	26	0¾	54·3	154¼	1575	2993	4568		837	1534	2371	10·
13b	27	0½	53·8	139	1600	3037	4637		862	1578	2440	9·
14a	27	1½	53·7	114¼	1583	3053	4636		845	1594	2439	7·
14b	27	0¼	53·2	121¾	1563	3103	4666		825	1644	2469	8·
15a	25	1½	53·8	146	1510	2877	4387		772	1418	2190	10·
15b	28	0	54·0	100¾	1614	3090	4704		876	1631	2507	6·
16a	32	2	52·0	165	1856	4117	5973		1118	2658	3776	9·
16b	32	3	51·7	193¼	1889	4207	6096		1151	2748	3899	11·
17a	24	0¼	54·1	107½	1409	2700	4109		671	1241	1912	8·
17b	26	1½	54·3	114¼	1548	2970	4518		810	1511	2321	8·
18a	15	1¼	54·5	94¼	929	1720	2649		191	261	452	11·
18b	16	1¼	54·6	73¾	963	1743	2706		225	284	509	8·
19	24	0½	53·0	158	1435	2743	4178		697	1284	1981	12·
20	12	0¼	51·5	99¼	722	1433	2155		−16	−26	−42	16·
21	15	2	52·5	78	893	1746	2639		155	287	442	9·
22	13	3¼	53·8	102½	847	1567	2414		109	108	217	13·

ENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

.—TABLE XIX.—PRODUCE of the 18TH SEASON, 1860-1. SEED (Red Rostock) n November 5, 1860; Crop cut August 20, and carted August 27, 1861.

PRODUCE PER ACRE, &c. (For the Manures see pp. 162 and 163). Dressed Corn. Quantity.		Weight per Bushel.	Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	INCREASE PER ACRE BY MANURE. Corn.	Straw and Chaff.	Total Produce.	Offal Corn to 100 Dressed.	Corn to 100 Straw.
Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
15	1½	57·6	116¾	1001	1768	2769	265	514	779	13·2	56·6
12	3¾	57·6	84	828	1387	2215	92	133	225	11·3	59·7
34	3¼	60·5	92	2202	3101	5303	1466	1847	3313	4·4	71·0
11	1½	57·4	84¼	736	1254	1990	..	..	..	13·0	58·7
11	3¼	58·0	175	863	1330	2193	127	76	203	25·4	64·9
15	1¾	59·1	134½	1047	1493	2540	311	239	550	14·8	70·1
15	1½	59·0	174½	1082	1610	2692	346	356	702	19·2	67·2
27	1¼	59·5	128¾	1755	2573	4328	1019	1319	2338	7·9	68·2
27	3½	59·4	167	1818	2683	4501	1082	1429	2511	10·1	67·8
35	2¼	59·0	167	2263	3501	5764	1527	2247	3774	8·0	64·6
34	1½	59·0	161½	2183	3555	5738	1447	2301	3748	8·0	61·4
36	0	58·3	190¾	2290	3913	6203	1554	2659	4213	9·1	58·5
34	0½	58·5	196¼	2190	3795	5985	1454	2541	3995	9·8	57·7
33	3	56·8	244¼	2162	4445	6607	1426	3191	4617	12·8	48·6
13	3	53·9	167¼	909	2170	3079	173	916	1089	22·6	41·9
12	3½	55·0	145½	854	1930	2784	118	676	794	20·5	44·2
15	3¾	55·5	148¼	1033	2163	3196	297	909	1206	16·8	47·8
23	1¾	55·3	160¾	1455	2577	4032	719	1323	2042	12·4	56·5
25	0¾	55·8	172	1578	2645	4223	842	1391	2233	12·2	59·7
32	1½	58·1	129½	2009	3192	5201	1273	1938	3211	6·9	63·0
33	1¾	58·7	182	2144	3337	5481	1408	2083	3491	9·3	64·3
33	1¼	59·9	170¼	2168	3318	5486	1432	2064	3496	8·5	65·4
35	0	60·0	205	2304	3490	5794	1568	2236	3804	9·8	66·0
33	0½	59·1	171¼	2125	3377	5502	1389	2123	3512	8·8	62·9
33	3¾	59·3	160½	2173	3303	5476	1437	2049	3486	8·0	65·8
34	1½	60·0	127½	2188	3318	5506	1452	2064	3516	6·2	65·9
34	3	60·2	158¼	2249	3478	5727	1513	2224	3737	7·6	64·7
36	1¾	58·0	222	2338	4423	6761	1602	3169	4771	10·5	52·8
37	2	58·6	233	2432	4343	6775	1696	3089	4785	10·6	56·0
19	1	59·3	89½	1229	1753	2982	493	499	992	7·9	70·1
18	0¾	59·1	92½	1166	1663	2829	430	409	839	8·6	70·1
32	1½	59·6	119½	2050	3094	5144	1314	1840	3154	6·2	66·2
33	1½	59·5	134½	2122	3324	5446	1386	2070	3456	6·8	63·8
33	2	58·8	197½	2107	3238	5345	1371	1984	3355	10·3	65·1
13	0½	57·9	111¼	872	1468	2340	136	214	350	14·6	59·4
16	1¾	58·2	152½	1109	1640	2749	373	386	759	15·9	67·6
19	2¼	58·5	152½	1306	1957	3263	570	703	1273	13·2	66·7

Experiments at Rothamsted on the Growth of Wheat Year after on the same Land.

Appendix.—Table XX.—Produce of the 19th Season, 1861-2. Seed (Red Ro
sown October 25, 1861; Crop cut August 29, and carted September 12, 1862

Plots.	Produce per Acre, &c. (For the Manures see pp. 162 and 163).							Increase per Acre by Manure.			Offal Corn to 100 Dressed.
	Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.	
	Quantity.		Weight per Bushel.								
	Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
0	19	3½	58·5	65	1228	2030	3258	232	317	549	5·6
1	16	2¾	58·0	55½	1024	1748	2772	28	35	63	5·7
2	38	1½	61·0	107	2447	4195	6642	1451	2482	3933	4·6
3	16	0	57·8	73½*	996	1713	2709	..	..	..	8·0
4	16	2½	58·5	75½	1049	1662	2711	53	−51	2	7·7
5a	17	3¾	59·0	58¾	1119	1840	2959	123	127	250	5·5
5b	17	2½	59·0	60¾	1101	1860	2961	105	147	252	5·9
6a	27	2	59·5	78½	1715	2839	4554	719	1126	1845	4·8
6b	28	3¼	59·8	76¼	1797	3100	4897	801	1387	2188	4·4
7a	35	2¼	59·3	92¾	2200	3906	6106	1204	2193	3397	4·4
7b	36	0¾	59·5	110¾	2265	3913	6178	1269	2200	3469	5·2
8a	39	3	59·2	122¼	2477	4723	7200	1481	3010	4491	5·2
8b	39	0½	59·0	141¼	2452	4635	7087	1456	2922	4378	6·1
9a	43	1¾	59·5	104½	2688	6050	8738	1692	4337	6029	4·0
9b	25	3½	56·3	186¼	1641	3256	4897	645	1543	2188	12·8
10a	23	0¼	56·5	154½	1457	2593	4050	461	880	1341	11·9
10b	24	3¼	57·5	172¾	1600	2843	4443	604	1130	1734	12·1
11a	26	2¾	58·0	156	1706	2842	4548	710	1129	1839	10·1
11b	27	0¼	58·0	166	1734	2873	4607	738	1160	1898	10·6
12a	34	1¼	58·0	104¼	2096	3649	5745	1100	1936	3036	5·2
12b	33	0¾	58·0	99¾	2025	3609	5634	1029	1896	2925	5·2
13a	31	3¾	58·0	100¾	1953	3589	5542	957	1876	2833	5·5
13b	32	2¾	58·0	124½	2019	3672	5691	1023	1959	2982	6·6
14a	30	1¾	58·0	120	1886	3397	5283	890	1684	2574	6·8
14b	32	0¼	58·1	144¼	2008	3550	5558	1012	1837	2849	7·7
15a	30	1¾	58·3	101	1872	3396	5268	876	1683	2559	5·7
15b	32	2¾	58·3	125	2029	3758	5787	1033	2045	3078	6·6
16a	36	1¼	58·0	120¾	2225	4527	6752	1229	2814	4043	5·7
16b	36	0½	57·5	155	2233	4497	6730	1237	2784	4021	7·5
17a	27	3½	58·1	128¼	1747	3080	4827	751	1367	2118	7·9
17b	27	2¼	58·1	85	1685	3077	4762	689	1364	2053	5·3
18a	18	1½	58·5	92	1168	1993	3161	172	280	452	8·6
18b	18	2¾	58·5	102	1195	2140	3335	199	427	626	9·3
19	23	1½	57·2	143¾	1479	2653	4132	483	940	1423	10·8
20	12	1½	57·3	108	818	1517	2335	−178	−196	−374	15·2
21	20	1½	58·1	90½	1273	2192	3465	277	479	756	7·6
22	20	0¼	58·0	86¾	1250	2180	3430	254	467	721	7·5

…MENTS AT ROTHAMSTED ON THE GROWTH OF WHEAT YEAR AFTER YEAR ON THE SAME LAND.

…DIX.—TABLE XXI.—PRODUCE of the 20TH SEASON, 1862-3. SEED (Red Rostock) …wn November 17 1862 Crop cut August 10, and carted August 18, 1863.

Produce per Acre, &c. (For the Manures see pp. 162 and 163).							Increase per Acre by Manure.			Offal Corn to 100 Dressed.	Corn to 100 Straw.
Dressed Corn.			Offal Corn.	Total Corn.	Straw and Chaff.	Total Produce (Corn and Straw).	Corn.	Straw and Chaff.	Total Produce.		
Quantity.		Weight per Bushel.									
Bush.	Pecks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
22	0½	62·6	42½	1429	1825	3,254	302	225	527	3·1	78·3
20	3	62·8	31½	1334	1745	3,079	207	145	352	2·4	76·4
44	0	63·1	109½	2886	4279	7,165	1759	2679	4438	4·0	67·5
17	1	62·7	47¼	1127	1600	2,727	..	..	..	4·4	70·4
20	1	62·3	41½	1303	1654	2,957	176	54	230	3·3	78·8
19	2½	63·0	46½	1283	1687	2,970	156	87	243	3·4	76·1
19	3	63·0	52¼	1296	1768	3,064	169	168	337	4·2	73·3
39	1½	62·3	69¼	2522	3714	6,236	1395	2114	3509	2·8	67·9
39	3	62·3	58¾	2534	3716	6,250	1407	2116	3523	2·4	68·2
53	1¼	62·6	140¾	3477	5853	9,330	2350	4253	6603	4·2	59·4
54	0	62·5	132¾	3507	5878	9,385	2380	4278	6658	3·9	59·7
56	2¼	62·3	145¾	3668	6715	10,383	2541	5115	7656	4·1	54·6
54	3¼	62·3	144¼	3559	6489	10,048	2432	4889	7321	4·2	54·8
55	2¼	62·1	123¼	3576	6312	9,888	2449	4712	7161	3·6	56·7
41	1¾	62·5	134	2723	4197	6,920	1596	2597	4193	5·2	64·9
39	0½	62·6	134½	2587	3481	6,068	1460	1881	3341	5·5	74·3
43	2¼	62·8	123¼	2858	4056	6,914	1731	2456	4187	4·5	70·5
45	0	62·5	167	2979	4233	7,212	1852	2633	4485	5·9	70·4
46	2	62·1	171¾	3060	4459	7,519	1933	2859	4792	5·9	68·6
54	2¾	62·1	133½	3533	5443	8,976	2406	3843	6249	3·9	64·9
53	1	62·2	141¾	3454	5365	8,819	2327	3765	6092	4·3	64·4
53	1	62·6	119	3453	5739	9,192	2326	4139	6465	3·6	60·2
53	1¼	62·5	107¾	3439	5799	9,238	2312	4199	6511	3·2	59·3
54	1¾	62·5	125¾	3527	5459	8,986	2400	3859	6259	3·7	64·6
53	1¾	62·5	110¾	3450	5299	8,749	2323	3699	6022	3·3	65·1
48	1¼	62·5	95¼	3114	5162	8,276	1987	3562	5549	3·2	60·3
48	0	62·9	109	3127	5113	8,240	2000	3513	5513	3·6	61·2
56	2¾	62·4	175¼	3710	7007	10,717	2583	5407	7990	5·0	53·0
55	0¼	62·3	172½	3607	6725	10,332	2480	5125	7605	5·0	53·6
21	0½	62·8	42	1370	1918	3,288	243	318	561	3·2	71·4
21	1½	62·8	46	1389	1903	3,292	262	303	565	3·4	73·0
46	1½	62·6	105½	3006	4883	7,889	1879	3283	5162	3·6	61·6
46	0¾	62·8	111¼	3009	4728	7,737	1882	3128	5010	3·8	63·6
46	2¾	62·9	118	3054	4523	7,577	1927	2923	4850	4·0	67·5
17	2¾	62·5	32	1137	1472	2,609	10	−128	−118	2·9	77·3
27	2½	62·5	69¼	1796	2483	4,279	669	883	1552	4·0	72·4
29	3	62·4	52½	1907	2692	4,599	780	1092	1872	2·8	70·[illegible]

EXPERIMENTS AT ROTHAMSTED ON THE GROW

APPENDIX.—TABLE XXII.—DRESSED

s.	HARVESTS. 1844.[1]		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		1853.		
	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.
)	19	3¾	32	0	28	1¾	30	2¾	19	0¾	..		19	1½	18	3½	15	0¾	9	0¾	26
	16	3	26	1¼	22	0¾	32	1	16	0¾	..		..		18	1¼	13	1	6	1¾	26
	20	1¾	32	0	27	0¾	29	3¾	25	2¾	31	0	28	2	29	2½	27	2¼	19	0¾	41
	15	0	23	0¾	17	3¾	16	3½	14	3	19	1	15	3¼	15	3½	13	3¼	5	3¼	21
	14	2¼	29	2½	25	3¾	27	1¾	24	0½	30	0	27	3	28	0½	13	1¼	7	1	23
a	15	2¼	22	2¼	19	0½	29	0	29	3½	37	1¼	29	3½	36	0	16	3	10	0	24
					27	0															
b			26	3¾	23	2½	32	2	30	3½	39	3½	30	3	37	3¾	17	0¼	10	1	24
					30	0¾															
a	15	1	28	2¾	20	1½	24	3¼	24	3¼	36	1½	30	0½	33	1¾	20	3	16	3¼	33
b					29	0¾	24	1¾	26	3	37	3¾	29	3½	31	0¼	20	3½	19	1	34
a	15	2	26	2¾	22	3¼	27	3¼	30	3¼	38	2½	32	1	36	3¼	26	2½	23	2¼	45
b					31	3	25	1¼	29	3¼	37	3¾	32	0¼	37	1½	26	3¾	23	2¼	45
a	15	0¾	27	0¼	22	3¼	32	1¾	19	3	22	3	28	3	26	0¾	27	3½	22	1¼	47
b					29	0¾	30	3	19	0¾	31	2½	30	1	27	2¼	27	0½	24	2¼	48
a	19	2¼	33	1½	23	2¾	22	3	18	2½	30	2¾	30	1½	31	1½	25	2	11	1	38
							26	2													
b					28	3½	26	0	25	0¼	22	1½	27	2¾	29	0¼	24	1¾	10	1¾	38
a	15	1¾	31	3¼	27	1½	25	3	19	1	32	2¼	26	3¾	28	3½	21	3½	9	3¾	34
b					17	2½	25	2¾	25	0¼	32	1¼	17	3¾	28	2½	22	0¼	15	2	39
a	17	0¾	30	3	23	1¾	30	3½	29	1½	35	0½	30	3¼	32	2¾	24	0¾	17	2	44
b					30	0¼	29	1¾	24	3	32	1¼	29	1½	31	2¾	22	1½	18	2¾	43
a	15	2	28	2¼	24	1½	29	2	29	3	35	3¼	29	3¾	32	3	24	1¾	22	0	45
b					28	2¾	27	0	26	0¾	34	1¼	30	3¾	32	2¼	24	1¼	23	3¼	45
a	16	1¼	25	0	24	0	29	2½	29	1¼	34	3¾	31	3¾	30	2¾	24	0	22	1¼	45
b					29	1¾	27	1¼	25	3¼	34	2¼	30	1½	30	3¼	23	3¾	23	2½	44
a	15	3	27	1	23	2½	28	0¾	28	0¼	34	1½	31	1¾	31	0¼	24	1¾	21	2	44
b					26	2½	26	3¾	25	2½	31	1¼	31	1½	31	0½	25	0¼	23	0¾	44
a	16	3¼	32	3¾	31	1¾	32	3	22	3¼	31	3¼	26	0¼	27	0½	23	1¼	19	0	44
b					27	2¾	32	0	24	2¾	30	0¾	30	3½	30	2½	25	0½	23	2½	43
a	19	3¼	32	3¼	23	3	29	1¼	29	3¼	33	1½	33	2½	36	3¼	28	3½	24	1½	49
b					30	1	34	2¼	30	1¾	33	3¾	33	3	36	2¾	28	0	25	3¼	50
a	18	3¾	32	0¾	33	2¾	33	3	27	2½	34	1	31	1	31	3½	25	2	8	1¾	45
b					30	2	35	1¾	28	3½	33	1¼	29	2½	30	2¼	24	1½	8	3¾	42
a	20	3¾	33	0¼	31	0	32	0¾	26	3	32	1¼	29	3¼	30	3¼	13	3	17	3¼	24
b					21	1	29	1½	26	2¾	33	2¼	28	2¼	31	0¾	14	3¾	20	3	23
)	24	1¼	34	3	28	3	32	3	29	1¾	29	2¼	29	0	30	1	24	3¾	19	1¼	41
)	..		24	2¾	..		20	0¾	16	0½	..		14	0	14	1	14	0¾	5	3¼	22
	..		..		..		..		..		..		..		17	3¼	19	1¾	12	3¾	32
	..		..		..		..		..		..		..				19	2¼	10	1	31

[1] See foot-note No. 5, to Appendix Table I. p. 147.

[2] For Plots 0, 1, 20, 21, and 22 the averages are for only 19, 18, 17, 13, and 13 years respectively.

[3] On Plots 17 and 18 the manures have alternated during the last 12 years; that is, ammonia-salts on and the mixed mineral manure on Plots 18, in one year; mineral manure on Plots 17, and ammonia-sa he next year, and so on

… AFTER YEAR ON THE SAME LAND.

… PECKS, per Acre, per Annum.

Harvests. 1857.		1858.		1859.		1860.		1861.		1862.		1863.		Average of 20 Years,[2] 1844-63.		Average of last 12 Years, 1852-63.		Plots.
…sh.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	bush.	pks.	
18	2¼	20	3	21	2¼	14	1¼	15	1½	19	3½	22	0½	20	1½	18	1	0
17	2¼	16	1¼	19	3	12	1¾	12	3¾	16	2¾	20	3	18	1	16	1½	1
…1	0¾	38	3¼	36	0¾	32	1¼	34	3½	38	1½	44	0	32	1¾	35	1½	2
…9	3¾	18	0	18	1¼	12	3½	11	1¼	16	0	17	1	16	1	15	2	3
…2	1¾	19	0½	19	0¾	14	2	11	3½	16	2½	20	1	20	2¼	16	3¾	4
…2	3¾	18	2¾	20	2¼	15	2¾	15	1¾	17	3¾	19	2½	22	0½	18	1	5*a*
…4	2¼	19	1	20	2½	16	0½	15	1½	17	2½	19	3	23	1	18	2¼	5*b*
…5	1½	28	2¼	29	2½	21	0½	27	1¼	27	2	39	1½	27	1¾	27	3¾	6*a*
…5	1¼	29	0½	30	0½	22	3¼	27	3½	28	3¼	39	3	28	1½	28	3	6*b*
…3	1¼	38	2¼	34	2¾	27	3½	35	2¼	35	2¼	53	1¼	33	1½	36	1	7*a*
…6	1½	39	2¼	34	2½	27	2¼	34	1¼	36	0¾	54	0	33	3	36	2¼	7*b*
…7	3	41	3¾	34	3¼	30	3	36	0	39	3	56	2¼	32	2	37	3¾	8*a*
…8	3¼	41	3¼	34	0¾	31	2¾	34	0¼	39	0½	54	3¼	33	1½	38	0¼	8*b*
…3	3	37	2¼	30	0	32	2½	33	3	43	1¾	55	2¼	31	1¼	34	2	9*a*
…6	0¾	23	2	24	2¼	19	2¼	13	3	25	3½	41	1¾	26	0½	25	3¼	9*b*
…9	0½	22	3½	18	3¾	15	0½	12	3½	23	0¼	39	0½	24	0	22	2½	10*a*
…4	2	27	3	25	2	18	2½	15	3¾	24	3¼	43	2¼	25	3½	26	3¾	10*b*
…9	0	30	3½	26	3½	22	1½	23	1¾	26	2¾	45	0	29	0¼	29	1	11*a*
…9	0¾	33	0¼	27	3¼	22	1½	25	0¾	27	0¼	46	2	29	1¼	30	0¼	11*b*
…3	3½	37	3¾	34	2½	28	0½	32	1½	34	1¼	54	2¾	32	1¾	35	0¾	12*a*
…3	2	37	0¾	34	3½	26	2¼	33	1¾	33	0¾	53	1	32	1¼	35	0¾	12*b*
42	3	37	0¾	34	0¾	26	0¾	33	1¼	31	3¾	53	1	31	2¾	34	1¼	13*a*
43	2	37	0¾	34	3½	27	0½	35	0	32	2¾	53	1¼	31	3¾	34	3½	13*b*
43	3	37	3¼	34	1¾	27	1½	33	0½	30	1¾	54	1¾	31	3½	34	3¼	14*a*
42	3½	38	1¼	34	2¼	27	0¼	33	3¾	32	0¼	53	1¾	31	3¾	35	0¾	14*b*
42	1¼	35	1½	34	0¾	25	1½	34	1¼	30	1¾	48	1¼	31	0	33	0¾	15*a*
44	1¾	37	2	35	0¼	28	0	34	3	32	2¾	48	0	32	0¾	34	3½	15*b*
48	3¼	41	3	34	3¾	32	2	36	1¾	36	1¼	56	2¾	35	0¼	38	2	16*a*
50	0	42	0½	34	1¾	32	3	37	2	36	0½	55	0¼	35	3	38	2	16*b*
26	2¾	33	1¼	21	1¼	24	0¼	19	1	27	3½	21	0½	27	1½	18	3¼[4]	17*a*
25	3¾	33	3¼	19	3	26	1½	18	0¾	27	2¼	21	1½	26	3¼			17*b*
41	0¼	22	3¾	32	3¼	15	1¼	32	1½	18	1½	46	1½	27	2½	32	2½[4]	18*a*
40	0¼	20	2¾	32	2	16	1¼	33	1½	18	2¾	46	0¾	27	0¾			18*b*
41	2½	33	1¼	30	2	24	0½	32	2	23	1½	46	2¾	30	3¾	31	2¾	19
19	2¾	17	0	17	3¼	12	0¼	13	0½	12	1½	17	2¾	16	1	15	2½	20
24	0	24	1¾	26	1½	15	2	16	1¾	20	1½	27	2½	21	3¼	22	0¾	21
23	0½	22	0	24	0¾	13	3¼	19	2¾	20	0¼	29	3	21	1½	21	2¾	22

…rage given for Plots 17 is that of 12 years mineral manure succeeding ammonia-salt…
…) and that given for Plots 18, of 12 years ammonia-salts succeeding the mine[ral m]anure (Plot…

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH OF

APPENDIX.—TABLE XXIII.—WEIGHT

Plots.	HARVESTS.										
	1844.[1]	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	185
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	58·5	56·5	62·3	61·1	58·4	..	60·8	61·9	55·8	49·8	61·0
1	59·0	54·8	62·6	61·2	59·6	..	..	61·7	56·9	46·9	60·2
2	59·3	56·8	63·0	62·3	58·2	63·8	61·9	63·6	58·2	51·1	62·5
3	58·5	56·5	63·8	61·0	57·3	61·4	60·6	61·1	56·6	45·9	60·6
4	58·0	58·0	63·5	61·9	58·5	63·0	61·2	62·6	57·3	46·6	61·1
5a	58·3	57·5	63·7 / 63·0	61·8	59·2	63·1	60·4	63·3	57·5	48·6	61·0
5b		57·3	63·4 / 63·3	61·4	59·1	63·4	60·4	63·3	57·3	48·6	61·6
6a	60·0	57·8	63·7	62·1	58·8	63·0	61·1	63·3	57·6	51·5	61·8
6b			63·5	61·6	56·9	63·0	61·3	62·3	57·5	51·5	61·8
7a	60·3	57·0	63·0	61·7	59·4	63·1	61·0	63·0	56·0	52·1	61·9
7b			63·4	61·5	59·6	62·9	61·2	63·0	55·8	51·9	61·8
8a	61·3	56·3	63·5	62·1	56·2	61·7	61·1	62·8	55·9	51·7	61·4
8b			63·6	61·7	59·4	63·0	61·0	62·6	55·9	51·8	61·8
9a	62·3	58·3	63·0	62·5 / 61·0	56·7	62·8	60·4	62·4	55·6	47·4	60·7
9b			63·3	61·3	58·3	62·3	60·8	62·0	55·3	46·9	60·7
10a	62·0	56·3	63·6	61·5	58·1	62·3	60·2	61·9	55·9	48·6	60·5
10b			63·8	61·2	57·8	62·3	61·1	62·5	57·3	49·5	61·6
11a	61·8	56·0	63·3	61·6	59·6	62·6	61·0	62·3	55·6	50·7	61·1
11b			63·2	61·8	57·9	63·0	61·1	62·5	55·9	51·1	61·2
12a	61·5	55·3	63·0	62·0	59·3	64·3	61·5	63·1	57·4	52·0	62·2
12b			63·4	61·8	59·2	64·3	61·4	62·5	57·3	51·9	62·2
13a	62·5	56·3	63·5	62·5	57·9	64·1	60·2	62·6	57·5	52·1	62·2
13b			63·2	62·3	58·4	64·1	61·0	62·3	57·1	51·9	62·2
14a	61·3	57·5	63·0	62·8	58·8	64·3	61·1	62·9	56·9	51·9	62·2
14b			63·4	62·8	58·5	64·3	61·5	62·8	56·7	52·4	62·2
15a	62·0	57·5	62·5	63·0	58·1	64·2	61·5	62·7	57·4	51·6	62·1
15b			63·0	62·6	56·9	64·1	61·0	62·9	56·8	51·7	62·4
16a	62·5	56·3	62·5	62·3	60·0	64·5	60·3	63·5	55·0	52·3	61·7
16b			62·7	62·6	58·4	64·6	60·4	63·4	54·5	52·3	61·7
17a[3]	62·3	55·8	62·8	62·3	59·7	64·3	61·2	63·3	56·5	49·5	62·1
17b			63·0	62·0	59·7	64·4	61·5	63·1	56·9	48·6	62·2
18a	62·0	56·5	62·8	62·7	59·2	64·0	61·2	63·0	57·0	52·6	61·2
18b			62·0	62·9	59·6	64·0	60·9	62·4	56·7	52·6	61·0
19	61·8	57·0	62·0	62·8	56·2	63·9	60·8	62·4	56·1	52·4	61·7
20	..	56·0	..	62·5	58·3	..	59·1	60·8	56·6	47·5	60·8
21	..	..	..	..	..	..	..	61·9	56·9	50·3	61·2
22	..	..	..	..	..	..	..		55·9	49·3	61·0

[1] See foot-note No. 5, to Appendix Table I. p. 147.

[2] For Plots 0, 1, 20, 21, and 22, the averages are for only 19, 18, 17, 13, and 13 years respectively.

[3] On Plots 17 and 18 the manures have alternated during the last 12 years; that is, ammonia-salts on Plots 17, and the mixed mineral manure on Plots 18, in one year; mineral manure on Plots 17, and ammonia-salts on Plots 18, in the next year, and so on.

AFTER YEAR ON THE SAME LAND.

)RESSED CORN, each Year.

	HARVESTS.							AVERAGE.		
57.	1858.	1859.	1860.	1861.	1862.	1863.	Of 20 Years,[2] 1844-63.	Of last 12 Years, 1852-63.	Plots.
bs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
·0	61·2	54·0	53·5	57·6	58·5	62·6	58·4	57·5	0
·0	60·7	55·0	52·8	57·6	58·0	62·8	58·1	57·2	1
·4	62·6	56·5	55·5	60·5	61·0	63·1	60·0	59·3	2
·3	60·4	52·5	52·6	57·4	57·8	62·7	57·9	56·5	3
·8	61·1	55·0	53·0	58·0	58·5	62·3	58·7	57·2	4
·0	61·5	56·0	54·0	59·1	59·0	63·0	59·1	57·9	5a
8·8	61·4	56·0	53·1	59·0	59·0	63·0	59·0	57·8	5b
9·9	62·1	56·5	53·7	59·5	59·5	62·3	59·6	58·6	6a
9·8	62·1	56·5	54·2	59·4	59·8	62·3	59·5	58·7	6b
0·5	61·9	55·9	54·3	59·0	59·3	62·6	59·5	58·4	7a
0·3	62·3	55·9	54·3	58·9	59·5	62·5	59·4	58·3	7b
0·8	61·8	54·0	52·8	58·3	59·2	62·3	58·9	57·8	8a
0·6	61·7	53·4	52·3	58·5	59·0	62·3	59·1	57·8	8b
0·1	60·8	54·5	51·5	56·8	59·5	62·1	58·4	57·1	9a
58·0	58·8	50·5	48·5	53·9	56·3	62·5	57·7	55·4	9b
58·0	59·6	51·5	49·5	55·0	56·5	62·6	57·8	55·9	10a
58·6	61·4	52·5	51·0	55·5	57·5	62·8	58·6	57·0	10b
58·5	60·5	51·4	51·0	55·3	58·0	62·5	58·3	56·4	11a
58·0	60·4	51·3	51·2	55·8	58·0	62·1	58·3	56·6	11b
60·4	62·1	54·5	53·4	58·1	58·0	62·1	59·4	58·2	12a
60·4	62·1	54·8	53·5	58·7	58·0	62·2	59·5	58·3	12b
60·6	62·1	55·0	54·3	59·9	58·0	62·6	59·6	58·6	13a
60·5	62·7	55·0	53·8	60·0	58·0	62·5	59·7	58·6	13b
60·5	62·1	54·5	53·7	59·1	58·0	62·5	59·6	58·3	14a
60·3	62·0	54·5	53·2	59·3	58·1	62·5	59·6	58·4	14b
60·4	62·6	55·0	53·8	60·0	58·3	62·5	59·7	58·6	15a
60·0	62·8	55·0	54·0	60·2	58·3	62·9	59·7	58·7	15b
60·5	62·1	52·6	52·0	58·0	58·0	62·4	59·2	57·6	16a
60·5	62·1	52·6	51·7	58·6	57·5	62·3	59·1	57·6	16b
59·1	62·5	55·0	54·1	59·3	58·1	62·8	59·5	58·0[4]	17a [3]
58·8	62·5	54·5	54·3	59·1	58·1	62·8	59·4		17b
59·7	62·3	55·5	54·5	59·6	58·5	62·6	59·7	58·7[4]	18a
59·8	62·4	56·0	54·6	59·5	58·5	62·8	59·6		18b
59·5	62·5	55·5	53·0	58·8	57·2	62·9	59·2	58·1	19
58·4	60·3	52·5	51·5	57·9	57·3	62·5	57·7	57·0	20
60·6	61·5	54·0	52·5	58·2	58·1	62·5	58·2	57·9	21
60·6	61·5	55·0	53·8	58·5	58·0	62·4	58·1	57·8	22

...rage given for Plots 17 is that of 12 years mineral manure succeeding ammonia-salts 18); and that given for Plots 18, of 12 years ammonia-salts succeeding the mineral 17 or 18).

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH

APPENDIX.—TABLE XXIV.—TOTAL CO

Plots.	Harvests. 1844.[1]	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	18[illegible]
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	[illegible]
0	1228	1967	1906	2031	1259	..	1220	1296	919	599	[illegible]
1	1040	1689	1509	2119	1124	..	..	1251	825	404	[illegible]
2	1276	1967	1826	1981	1705	2068	1861	2049	1716	1120	[illegible]
3	923	1441	1207	1123	952	1229	1002	1083	860	359	[illegible]
4	888	1879	1777	1780	1583	2063	1785	1919	870	446	[illegible]
5a	956	1431	1305 / 1827	1921	1911	2446	1974	2473	1038	587	[illegible]
5b		1732	1598 / 2076	2132	1932	2651	2018	2611	1065	611	[illegible]
6a	964	1871	1400	1663	1672	2410	1960	2271	1288	978	[illegible]
6b			1967	1632	1737	2484	1980	2119	1300	1072	[illegible]
7a	984	1682	1534	1834	1936	2576	2134	2524	1615	1369	[illegible]
7b			2163	1682	1963	2531	2112	2532	1643	1357	[illegible]
8a	980	1716	1549	2115	1263	1481	1856	1785	1699	1346	[illegible]
8b			1988	2020	1267	2080	1948	1863	1651	1425	[illegible]
9a	1280	2131	1614	1477 / 1755	1181	2035	1951	2142	1591	691	[illegible]
9b			1942	1717	1669	.1475	1762	1970	1509	649	[illegible]
10a	1008	1980	1850	1702	1334	2141	1721	1966	1320	642	[illegible]
10b			1216	1705	1604	2157	1171	1937	1343	896	[illegible]
11a	1116	1880	1628	2044	1984	2317	2001	2216	1472	1015	[illegible]
11b			2055	1941	1641	2149	1940	2163	1387	1073	[illegible]
12a	1004	1842	1661	1953	1938	2396	1935	2234	1503	1283	[illegible]
12b			1955	1796	1717	2277	2013	2203	1492	1375	[illegible]
13a	1072	1558	1660	1959	1955	2340	2027	2102	1480	1341	[illegible]
13b			1998	1801	1730	2346	1964	2083	1476	1396	[illegible]
14a	1016	1743	1605	1944	1834	2266	2023	2120	1507	1322	[illegible]
14b			1812	1856	1726	2123	1995	2121	1530	1347	[illegible]
15a	1096	2103	2112	2214	1571	2109	1693	1839	1451	1143	[illegible]
15b			1861	2140	1607	2005	1942	2077	1520	1351	[illegible]
16a	1304	2028	1592	1959	1973	2254	2134	2499	1794	1496	[illegible]
16b			2019	2283	1948	2268	2159	2501	1700	1537	[illegible]
[3] 17a	1240	2093	2241	2222	1933	2316	1985	2149	1577	520	[illegible]
17b			2034	2314	1946	2259	1961	2079	1520	539	[illegible]
18a	1368	2048	2048	2160	1734	2163	1934	2083	869	1111	[illegible]
18b			1474	2029	1804	2243	1845	2090	921	1256	[illegible]
19	1580	2114	1889	2195	1838	1994	1850	2031	1582	1160	[illegible]
20	..	1495	..	1332	1050	..	868	956	875	425	[illegible]
21	..	..	..	..	..	..	..	1232	1177	753	[illegible]
22	..	..	..	..	..	..	..		1176	592	[illegible]

[1] See foot-note No. 5, to Appendix Table I. p. 147.

[2] For Plots 0, 1, 20, 21, and 22, the averages are for only 19, 18, 17, 13, and 13 y respectively.

[3] On Plots 17 and 18 the manures have alternated during the last 12 years; that is, ammo salts on Plots 17, and the mixed mineral manure on Plots 18, in one year; mineral manure Plots 17, and ammonia-salts on Plots 18, in the next year, and so on.

.R AFTER YEAR ON THE SAME LAND.

:re, per Annum.

Harvests.							Average.		Plots.
1857.	1858.	1859.	1860.	1861.	1862.	1863.	Of 20 Years,[2] 1844-63.	Of last 12 Years, 1852-63.	
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1181	1332	1254	826	1001	1228	1429	1296	1143	0
118	1055	1189	717	828	1024	1334	1169	1025	1
587	2512	2263	1864	2202	2447	2886	2076	2232	2
236	1141	1051	738	736	996	1127	1026	964	3
186	1206	1188	832	863	1049	1303	1327	1072	4
09	1187	1277	903	1047	1119	1283	1422	1146	5*a*
12	1227	1273	935	1082	1101	1296	1495	1169	5*b*
11	1818	1808	1210	1755	1715	2522	1759	1747	6*a*
3	1850	1855	1326	1818	1797	2534	1815	1796	6*b*
2	2450	2097	1612	2263	2200	3477	2121	2268	7*a*
2	2530	2089	1597	2183	2265	3507	2152	2283	7*b*
8	2680	2068	1759	2290	2477	3668	2064	2377	8*a*
9	2675	2007	1787	2190	2452	3559	2125	2386	8*b*
7	2384	1806	1858	2162	2688	3576	1991	2161	9*a*
0	1470	1412	1155	909	1641	2723	1670	1621	9*b*
6	1439	1207	905	854	1457	2587	1547	1435	10*a*
5	1775	1500	1060	1033	1600	2858	1655	1693	10*b*
2	1977	1628	1270	1455	1706	2979	1860	1834	11*a*
7	2099	1698	1307	1578	1734	3060	1875	1885	11*b*
47	2437	2060	1648	2009	2096	3533	2064	2194	12*a*
29	2387	2115	1577	2144	2025	3454	2065	2207	12*b*
14	2384	2037	1575	2168	1953	3453	2032	2165	13*a*
39	2397	2087	1600	2304	2019	3439	2049	2203	13*b*
81	2413	2054	1583	2125	1886	3527	2042	2191	14*a*
99	2436	2074	1563	2173	2008	3450	2043	2205	14*b*
681	2285	2053	1510	2188	1872	3114	1989	2088	15*a*
765	2436	2095	1614	2249	2029	3127	2053	2186	15*b*
3131	2702	2026	1856	2338	2225	3710	2239	2420	16*a*
3194	2717	2005	1889	2432	2233	3607	2284	2431	16*b*
1642	2150	1247	1409	1229	1747	1370	1761	1181[4]	17*a*[3]
1583	2181	1168	1548	1166	1685	1389	1724		17*b*
2566	1472	1973	929	2050	1168	3006	1774	2054[4]	18*a*
2519	1338	1980	963	2122	1195	3009	1751		18*b*
2600	2177	1903	1435	2107	1479	3054	1984	2016	19
1213	1089	1039	722	872	818	1137	1033	989	20
1538	1574	1538	893	1109	1273	1796	1373	1384	21
1491	1412	1460	847	1306	1250	1907	1352	1362	22

...rage given for Plots 17 is that of 12 years mineral manure succeeding ammonia-salts ...18); and that given for Plots 18, of 12 years ammonia-salts succeeding the mineral ...17 or 18).

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH O

APPENDIX.—TABLE XXV.—TOTAL STRA

Plots.	Harvests. 1844.[1]	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	185
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lb
0	1436	3977	2561	3277	2074	..	2037	1862	1706	1807	311
1	1203	3699	1953	3735	1735	..	..	1845	1497	1632	255
2	1476	3915	2454	3628	3041	3029	3245	3094	3457	3372	44
3	1120	2712	1513	1902	1712	1614	1719	1627	1597	1413	21
4	1104	3663	2390	2948	2713	2645	3312	2949	1571	1670	23
5a	1116	2684	1541 / 2309	3412	3266	3589	4504	4131	1903	1951	25
5b		3599	1721 / 2901	3721	3533	3824	4379	4294	2032	2130	250
6a	1100	3644	1676	2786	2878	3072	3927	3624	2581	2777	384
6b			2571	2803	2968	3516	3959	3507	2604	2798	405
7a	1172	3243	1968	3151	3088	3584	4485	4587	3850	3741	560
7b			3007	2953	3413	3396	4280	4302	3772	3734	549
8a	1160	3663	1963	3683	2317	1815	3407	2769	3806	3966	612
8b			2575	3720	2148	3166	3591	2830	3772	3927	611
9a	1368	4058	2033	2506 / 3052	1945	2683	3550	3252	3714	2399	414
9b			2603	2858	2918	1810	3165	2942	3374	2253	424
10a	1112	4266	2244	2891	2367	2851	3089	3070	2787	2049	359
10b			1455	2874	2926	2960	1949	3048	2819	2682	446
11a	1200	4104	2133	3517	3274	2892	3806	3386	3081	2524	514
11b			2715	3203	2898	2942	3741	3302	2912	2707	50
12a	1116	4134	2163	3452	3390	3371	3921	3600	3257	3665	560
12b			2554	3124	2880	3300	3905	3581	3232	3704	547
13a	1204	3355	2327	3306	3290	3236	4026	3544	3222	3704	53
13b			2755	3171	3072	3246	4008	3440	3289	3912	554
14a	1176	3696	2031	3362	3257	3211	4052	3605	3547	3471	555
14b			2534	3006	2897	3218	4015	3537	3607	3761	541
15a	1240	4044	2936	3876	2937	3038	3321	3041	3212	3361	489
15b			2513	3617	3016	3262	3926	3432	3421	3756	527
16a	1480	4191	2067	3417	3115	3384	5103	4234	4677	4904	670
16b			2836	4012	3380	3559	4615	4332	4616	5019	663
17a[3]	1422	3826	3278	4027	3296	3891	4126	3597	3734	1996	527
17b			2784	4261	3324	3858	4034	3406	3466	2012	489
18a	1768	3819	2838	3852	2935	3592	3927	3390	1687	3385	241
18b			1893	4164	3056	3779	3844	3586	1764	3796	237
19	1772	4215	2425	4202	3295	3270	3527	3348	3397	3213	467
20	..	3104	..	2074	1721	..	1639	1609	1577	1659	221
21	..	..	..	..	..	..	..	1763	2108	2181	344
22	..	..	..	..	..	..	..		2179	1860	334

[1] See foot-note No. 5, to Appendix Table I. p. 147.

[2] For Plots 0, 1, 20, 21, and 22 the averages are for only 19, 18, 17, 13, and 13 yea respectively.

[3] On Plots 17 and 18 the manures have alternated during the last 12 years; that is, ammoni salts on Plots 17, and the mixed mineral manure on Plots 18, in one year; mineral manure on Pl 17, and ammonia-salts on Plots 18, in the next year, and so on.

AFTER YEAR ON THE SAME LAND.

lbs., per Acre, per Annum.

	Harvests.						Average.		Plots.
.	1858.	1859.	1860.	1861.	1862.	1863.	Of 20 Years,[2] 1844-63.	Of last 12 Years, 1852-63.	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
[illegible]	1902	2310	1445	1768	2030	1825	2072	1846	0
[illegible]	1630	2300	1380	1387	1748	1745	1965	1767	1
[illegible]	3837	4810	3440	3101	4195	4279	3515	3869	2
[illegible]	1670	2175	1459	1254	1713	1600	1693	1662	3
[illegible]	1673	2230	1520	1330	1662	1654	2125	1732	4
7	1532	2323	1580	1493	1840	1687	2345	1856	5a
5	1643	2393	1660	1610	1860	1768	2501	1938	5b
7	2577	3747	2183	2573	2839	3714	2909	2957	6a
7	2713	3853	2393	2683	3100	3716	3044	3067	6b
0	3965	4677	3003	3501	3906	5853	3776	4187	7a
1	4092	4803	3137	3555	3913	5878	3830	4236	7b
7	4667	5353	3880	3913	4723	6715	3862	4706	8a
0	4667	5597	3813	3795	4635	6489	3977	4725	8b
7	4317	5270	4777	4445	6050	6312	3739	4426	9a
3	2688	3590	3130	2170	3256	4197	2998	3187	9b
2	2130	2730	2213	1930	2593	3481	2656	2603	10a
75	2615	3420	2360	2163	2843	4056	2866	3061	10b
43	2797	3527	2503	2577	2842	4233	3124	3181	11a
20	3018	3577	2693	2645	2873	4459	3176	3285	11b
47	3663	4550	3230	3192	3649	5443	3617	3932	12a
83	3673	4743	3087	3337	3609	5365	3607	3962	12b
07	3693	4737	2993	3318	3589	5739	3582	3945	13a
47	3677	4807	3037	3490	3672	5799	3632	4033	13b
58	3737	4763	3053	3377	3397	5459	3609	3983	14a
52	3710	4700	3103	3303	3550	5299	3615	4019	14b
687	3515	4773	2877	3318	3396	5162	3499	3795	15a
778	3698	4993	3090	3478	3758	5113	3669	4028	15b
683	4797	5927	4117	4423	4527	7007	4441	5152	16a
703	4813	5793	4207	4343	4497	6725	4511	5151	16b
2058	3203	2483	2700	1753	3080	1918	3060	1985[4]	17a [3]
940	2274	2373	2970	1663	3077	1903	2988		17b
3443	2068	4533	1720	3094	1993	4883	3065	3755[4]	18a
3365	1967	4650	1743	3324	2140	4728	3096		18b
3193	3185	4023	2743	3238	2653	4523	3416	3521	19
1564	1730	2217	1433	1468	1517	1472	1807	1714	20
1815	2373	3185	1746	1640	2192	2483	2298	2343	21
1807	2180	2980	1567	1957	2180	2692	2266	2308	22

ge given for Plots 17 is that of 12 years mineral manure succeeding ammonia-salts ; and that given for Plots 18, of 12 years ammonia-salts succeeding the mineral 7 or 18).

EXPERIMENTS AT ROTHAMSTED ON THE GROWTH O

APPENDIX.—TABLE XXVI.—TOTAL PRODUC

Plots.	Harvests. 1844.[1]	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	185
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0	2664	5944	4467	5308	3333	..	3257	3158	2625	2406	37
1	2243	5388	3462	5854	2859	..	..	3096	2322	2036	40
2	2752	5882	4280	5609	4746	5097	5106	5143	5173	4492	71
3	2043	4153	2720	3025	2664	2843	2721	2710	2457	1772	34
4	1992	5542	4167	4728	4296	4708	5097	4868	2441	2116	385
5a	2072	4115	2846 / 4136	5333	5177	6035	6478	6604	2941	2538	40
5b		5331	3319 / 4977	5853	5465	6475	6397	6905	3097	2741	403
6a	2064	5515	3076	4449	4550	5482	5887	5895	3869	3755	603
6b			4538	4435	4705	6000	5939	5626	3904	3870	629
7a	2156	4925	3502	4985	5024	6160	6619	7111	5465	5110	855
7b			5170	4635	5376	5927	6392	6834	5415	5091	844
8a	2140	5379	3512	5798	3580	3296	5263	4554	5505	5312	920
8b			4563	5740	3415	5246	5539	4693	5423	5352	93
9a	2648	6189	3647	3983 / 4807	3126	4718	5501	5394	5305	3090	650
9b			4545	4575	4587	3285	4927	4912	4883	2902	67
10a	2120	6246	4094	4593	3701	4992	4810	5036	4107	2691	580
10b			2671	4579	4530	5117	3120	4985	4162	3578	700
11a	2316	5984	3761	5561	5258	5209	5807	5602	4553	3539	800
11b			4770	5144	4539	5091	5681	5465	4299	3780	777
12a	2120	5976	3824	5405	5328	5767	5856	5834	4760	4948	846
12b			4509	4920	4597	5577	5918	5784	4724	5079	841
13a	2276	4913	3987	5265	5245	5576	6053	5646	4702	5045	831
13b			4753	4972	4802	5592	5972	5523	4765	5308	840
14a	2192	5439	3636	5306	5091	5477	6075	5725	5054	4793	849
14b			4346	4862	4623	5341	6010	5658	5137	5108	828
15a	2336	6147	5048	6090	4508	5147	5014	4880	4663	4504	769
15b			4374	5757	4623	5267	5868	5509	4941	5107	808
16a	2784	6219	3659	5376	5088	5638	7237	6733	6471	6400	993
16b			4855	6295	5328	5827	6774	6833	6316	6556	992
[3] 17a	2662	5919	5519	6249	5229	6207	6111	5746	5311	2516	821
17b			4818	6575	5270	6117	5995	5485	4986	2551	762
18a	3136	5867	4886	6012	4669	5755	5861	5473	2556	4496	394
18b			3367	6193	4860	6022	5689	5676	2685	5052	388
19	3352	6329	4314	6397	5133	5264	5377	5379	4979	4373	734
20	..	4599	..	3406	2771	..	2507	2565	2452	2084	366
21	..	..	..	..	..	..	..	2995	3285	2934	547
22	..	..	..	..	..	..	..		3355	2432	53

[1] See foot-note No. 5, to Appendix Table I. p. 147.

[2] For Plots 0, 1, 20, 21, and 22, the averages are for only 19, 18, 17, 13, and 13 ye respectively.

[3] On Plots 17 and 18 the manures have alternated during the last 12 years; that is, ammon salts on Plots 17, and the mixed mineral manure on Plots 18, in one year; mineral manure on Plots 1 and ammonia-salts on Plots 18, in the next year, and so on.

AFTER YEAR ON THE SAME LAND.

AW), in lbs., per Acre, per Annum.

Harvests.							Average.		Plots.
1857.	1858.	1859.	1860.	1861.	1862.	1863.	Of 20 Years,[3] 1844-63.	Of last 12 Years, 1852-63.	
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
2726	3234	3564	2271	2769	3258	3,254	3368	2989	0
2650	2685	3489	2097	2215	2772	3,079	3134	2792	1
5910	6349	7073	5304	5303	6642	7,165	5591	6101	2
2813	2811	3226	2197	1990	2709	2,727	2719	2626	3
2958	2879	3418	2352	2193	2711	2,957	3452	2804	4
3026	2719	3600	2483	2540	2959	2,970	3767	3002	5a
3247	2870	3666	2595	2692	2961	3,064	3996	3107	5b
1968	4395	5555	3393	4328	4554	6,236	4668	4704	6a
1950	4563	5708	3719	4501	4897	6,250	4859	4863	6b
462	6415	6774	4615	5764	6106	9,336	5897	6455	7a
793	6622	6892	4734	5738	6178	9,385	5982	6519	7b
355	7347	7421	5639	6203	7200	10,383	5926	7083	8a
579	7342	7604	5600	5985	7087	10,048	6102	7111	8b
634	6701	7076	6635	6607	8738	9,888	5730	6587	9a
203	4158	5002	4285	3079	4897	6,920	4668	4808	9b
208	3569	3937	3118	2784	4050	6,068	4203	4038	10a
060	4390	4920	3420	3196	4443	6,914	4521	4754	10b
375	4774	5155	3773	4032	4548	7,212	4984	5015	11a
317	5117	5275	4000	4223	4607	7,519	5051	5170	11b
394	6100	6610	4878	5201	5745	8,976	5681.	6126	12a
312	6060	6858	4664	5481	5634	8,819	5672	6169	12b
421	6077	6774	4568	5486	5542	9,192	5614	6110	13a
386	6074	6894	4637	5794	5691	9,238	5681	6236	13b
5439	6150	6817	4636	5502	5283	8,986	5651	6174	14a
6351	6146	6774	4666	5476	5558	8,749	5658	6224	14b
6368	5800	6826	4387	5506	5268	8,276	5488	5883	15a
6543	6134	7088	4704	5727	5787	8,240	5722	6214	15b
7814	7499	7953	5973	6761	6752	10,717	6680	7572	16a
7897	7530	7798	6096	6775	6730	10,332	6795	7582	16b
3700	5353	3730	4109	2982	4827	3,288	4821	3166[4]	17a
3523	5455	3541	4518	2829	4762	3,292	4712		17b
6009	3480	6506	2649	5144	3161	7,889	4839	5809[4]	18a
5884	3305	6630	2706	5446	3335	7,737	4847		18b
5793	5362	5926	4178	5345	4132	7,577	5400	5537	19
2777	2819	3256	2155	2340	2335	2,609	2840	2703	20
3353	3947	4723	2639	2749	3465	4,279	3671	3727	21
3298	3592	4440	2414	3263	3430	4,599	3618	3670	22

…tage given for Plots 17 is that of 12 years mineral manure succeeding ammonia-salts 18); and that given for Plots 18, of 12 years ammonia-salts succeeding the mineral s 17 or 18).

VI.—*On Peruvian Guano and the Means of Increasing its Efficacy as a Manure.* By Dr. Augustus Voelcker.

Peruvian guano, like well-made farmyard-manure, has been found to benefit more or less all kinds of crops grown on every description of land. For this reason it is considered a more universal fertiliser than artificial manures, which, like nitrate of soda, wool-refuse, horn-shavings, &c., exercise a beneficial action upon vegetation solely in virtue of their nitrogen, and consequently should only be used in special cases and with great discrimination, especially on soils deficient in the mineral substances found in the ashes of plants.

With the exception of a trifling quantity of sand, seldom exceeding 2 per cent., and 12 to 15 per cent. of moisture, genuine Peruvian guano contains nothing which is not of great utility to vegetation.

We find, indeed, in it in a concentrated state the most valuable fertilising constituents, and do not meet in it with substances which, though necessary to a healthy growth of plants, are abundantly distributed throughout most soils, and therefore may well be dispensed with in a concentrated manure.

But although it contains potash, soda, chloride of sodium, lime, magnesia, oxide of iron, phosphoric acid, sulphuric acid, and silica, or nearly all the ash-constituents of plants, the large amount of ammoniacal salts and nitrogenous organic matters which enter into it chiefly determine its commercial and agricultural value.

Ammoniacal salts and nitrogenous matters possess a money value which is, in a great measure, independent of the demand of the agriculturist for these materials. Guano, when cheap, may and has been used as the raw material for the manufacture of spirits of hartshorn, carbonate and sulphate of ammonia, and also for preparing Prussian-blue, murexide-purple, and other dyes, and such competition would disturb, and possibly might injure, the market for the farmer.

In my own mind I have no doubt that Peruvian guano is worth more to the agriculturist and the dealer in artificial manures than to other chemical manufacturers, because its constitution is one that gives it special value as food for plants; as source of nitrogen, it differs materially from wool-refuse (shoddy) (which being impregnated with oil dissolves but slowly in the soil, and is therefore far less valuable,) and resembles a quick acting because rapidly decomposing material, such as blood or fish-refuse.

Genuine Peruvian guano contains from 6 to 7 per cent. of ready-formed ammonia, and an amount of nitrogenous organic constituents which on decomposition yield about 12 per cent

of ammonia. The phosphates which guano contains—bone-earth in a finely divided state to the extent of 22 to 24 per cent.—as well as its soluble alkaline phosphates, are presented in a very valuable shape. Its alkalies, specially the potash, will much benefit crops on light soils, which are generally deficient in this element.

As long as Peruvian guano was sold at a price which left a broad margin for profit, many farmers did not trouble themselves to enquire whether they derived the utmost advantage from its application, or whether they did not incur a partial waste by applying it to crops or upon soils for which other fertilisers were better suited. But a gradual rise in price compelled them to study greater economy in its use, and to try experiments with a view of ascertaining when, and in what quantities, for what crops, and upon what soils, it should be used.

The successful employment of superphosphate and similar artificial manures, prepared more particularly for root-crops, has at the same time very much tended to enlarge our experience and knowledge on the relative merits of phosphatic and ammoniacal fertilisers. The high price of guano for the moment aided the introduction of superphosphate, and gave greater range and precision to this branch of agricultural science.

The true interests of the importers of guano and the manufacturers of manures are not opposed to each other; for Peruvian guano, judiciously used for special purposes, can well compete with other artificial manures; and for other purposes a much cheaper manure may often be used with greater advantage in preference to guano.

It appears desirable that Peruvian guano, as hitherto, should be sold genuine by the recognised agents of the sole importers; and the supervision which the importers exercise in appointing respectable agents, and the care they take to prevent the adulteration of guano, deserve all praise. If, however, it can be shown that the efficacy of Peruvian guano may be greatly increased by certain chemical and mechanical means, requiring more time and attention than the farmer is likely to bestow upon it; and that the admixture of other fertilising matters renders guano more useful in many cases, it must surely be an advantage to the importers to give fitting opportunity for its being so treated and combined.

If it were true that the proportion of nitrogen in the organic matters and of ammoniacal salts in manures solely determined their efficacy and value, in reference to all crops, in all climates, and on every description of soil, Peruvian guano, perhaps, would be pre-eminently the most valuable artificial manure. We know, however, very well that this large supply of nitrogen is, in some cases, of no use whatever, and in others exercises a decidedly in-

jurious effect. There are clay soils in Gloucestershire, Herefordshire, and other counties, on which the application of ammoniacal salts to root-crops often diminishes the crop, and, at the best, is of no benefit whatever to the swedes or turnips. Again, on light sandy soils, although for a time highly nitrogenous manures may largely increase the yield of corn, yet their exclusive and long continued use leads to a rapid exhaustion of the soil in those mineral constituents of which an abundant supply is required by all cultivated plants. On the other hand, there are certain loamy soils on which Peruvian guano is used with great advantage for grass and corn crops, especially as a top-dressing for wheat and barley; and the only question which arises is, whether the required nitrogen is more economically applied to the land in that shape, than as nitrate of soda, sulphate of ammonia, soot, &c.

Preparation of Guano.

When guano is used as a top-dressing, or is drilled in, more care should be taken than is frequently bestowed to apply it in a good mechanical condition. It should never be sown without having been submitted to the rather tedious and unpleasant process of sifting and grinding into a fine powder. The hard lumps, varying from the size of a pea to that of an egg, which always occur in good Peruvian guano, do not materially differ in composition from the finer particles, and should be reduced to as fine a powder as the rest.

If guano is sown without such preparation, the fine dust will be carried away too readily by the wind, and the coarser portions will fall too much together in one place. In consequence of this unequal distribution, the young plants will be burned up where the lumps drop, near-by there will be a rank growth, and the crop will ripen unequally. The danger arising from unequal distribution is less when the manure is applied to the land in autumn before sowing the seed-corn. This practice should be adopted in all cases in which the soil contains a fair amount of clay, which, in virtue of its well-known absorbing properties, retains the fertilizing constituents of guano, so that the rain falling upon the land during the winter months, instead of removing the most valuable manuring substances, as in the case of light sandy soils, has the advantage of disseminating them uniformly through the soil.

Mechanical Preparation of Guano.

It has been recommended to sift the guano, to spread the lumps retained by the sieve on a clean stone-floor, and to pass a garden-roller over them, or to beat them down with the back of a shovel

r a turf-beater. It is extremely difficult, however, by these means o reduce them to a sufficiently fine powder. Even grinding under a millstone does not answer the purpose, for guano is very apt to cake under the stone. It therefore requires to be mixed with some material which counteracts this tendency to cake. Gypsum, fine ashes, salt, charcoal-dust, and dry soil, are some of the materials that have been recommended. Gypsum, however, does not prevent the caking; it therefore is ill suited for the purpose. Salt likewise is objectionable; for it gives the guano a moist appearance, and rather increases than diminishes the difficulty. Finely-sifted coal or wood ashes, charcoal-dust, and dry soil, answer better; but perhaps the best material for effecting the reduction of guano to a fine powder is sharp sand.

The proper way of proceeding is first to sift off all the fine guano-dust, then to mix the hard lumps left in the sieve with about twice their bulk of sand, to spread the mixture on an even floor, and to pass a heavy roller over it, or to beat down the lumps with a wooden mallet. The admixture of sand prevents the caking of the guano, and greatly facilitates its reduction to fine powder. After the whole has gone through the sieve, salt in the proportion of two parts by weight to one of guano may be added with great advantage. The moisture imparted to the guano by the salt prevents the dusting, which is so great an inconvenience in sowing it by hand. Salt in conjunction with guano, moreover, has a specific action on vegetation, which is specially beneficial to corn-crops on light soils.

Analyses of Guano.

Notwithstanding that many elaborate and careful analyses have been made, some peculiarities in the chemical constitution of Peruvian guano have been passed by either unnoticed or have not attracted the degree of attention to which they are entitled. In order to render more intelligible in what these peculiarities consist, and how far they affect our endeavours to render guano more efficacious, I would invite attention to the following analyses of three samples of Peruvian guano of this year's importation.

Composition of Three Samples of Peruvian Guano.

Moisture	18·42	15·14	16·56
*Organic matters and salts of ammonia	52·11	52·81	51·70
Phosphates of lime and magnesia (bone-earth)	21·99	20·26	23·55
†Alkaline salts	6·37	10·52	6·44
Insoluble siliceous matters (sand)	1·11	1·27	1·75
	100·00	100·00	100·00
*Containing nitrogen	15·34	15·41	15·13
Equal to ammonia	18·62	18·69	18·37
†Containing phosphoric acid	2·23	2·48	1·08
Equal to bone-earth	4·83	5·36	2·34

Organic Matter and Salts of Ammonia.—For all practical purposes it is quite sufficient to determine together organic matters and ammoniacal salts, and to indicate how much ammonia will be produced by 100 parts of guano on its final decomposition in the soil.

The salts of ammonia, as well as the organic matters, include several distinct chemical compounds. Phosphate, sulphate, oxalate, urate, and carbonate of ammonia are constantly present in Peruvian guano; but the relative proportion of these salts varies to a considerable extent in different samples. The organic matter includes uric acid, a little urea, oxalic acid, guanine, and other nitrogenised substances, and also butyric, phocenic, and similar fatty acids, to which the peculiar and characteristic smell of guano is principally due. With the exception of the fatty acids, all these organic substances are rich in nitrogen, and very prone to suffer decomposition in the presence of water. The most important product of their decomposition is ammonia. The strong and pungent smell of guano damaged by sea-water is due to ammonia, and indicates a partial decomposition which the nitrogenous organic matters have sustained. Such a decomposition does not take place without loss of ammonia. Hence dark-coloured and pungent-smelling samples are generally poorer in nitrogen, and less valuable than those which are light-coloured, dry, and far less pungent. Uric acid and urate of ammonia, which are nearly insoluble in water, contain fully one-third of their weight of nitrogen. As long as guano is kept in a dry atmosphere, the nitrogen in these compounds remains in a fixed condition. Under the influence of oxygen and a certain temperature, uric acid in the presence of water passes through a very remarkable series of transformations, producing allantoin, urea, and oxalic acid. Urea in its turn is readily resolved into carbonate of ammonia. These changes in the nitrogenised constituents proceed rapidly when guano is incorporated with a moist soil. It cannot, therefore, be doubted that the nitrogenous matters of guano, in virtue of the ammonia they produce, are as useful to vegetation as the actual ammonia which occurs in it in the shape of ammoniacal salts. For all practical purposes, therefore, the distinction between actual ammonia and potential ammonia * is of little significance, and the same money-value which is given to the actual ammonia may with propriety be assigned to the ammonia which guano is capable of yielding on decomposition.

Oxalic acid, it will be noticed, is a product of decomposition of uric acid, and therefore is always present in damaged guano

* That is to say, the ammonia which nitrogenous matters are capable of evolving gradually in the soil.

in greater abundance than in dry and sound samples. In good samples, which have an aromatic rather than pungent smell, I find invariably a large proportion of uric and little oxalic acid, and in inferior, dark, strong-smelling damaged samples, comparatively speaking, little uric and much oxalic acid; therefore a large amount of oxalic acid in guano indicates inferior quality. The oxalic acid, however, as we shall see hereafter, plays an important part in rendering the insoluble phosphatic constituents soluble.

Ready-formed Ammonia in Guano.

In a scientific point of view, the determination of ready-formed ammonia in guano is of some interest. In a practical point of view, it likewise appeared to me desirable to ascertain whether or not guano contains any free or, more properly speaking, volatile carbonate of ammonia. I therefore determined in the preceding samples both the amount of free ammonia and that present in the shape of ammoniacal salts.

For this purpose 100 grains of each sample were introduced into a glass retort, and mixed with 4 ozs. of distilled water. The retort was connected air-tight with a glass receiver, to which was attached the bulb apparatus, used in nitrogen combustion. Both the glass receiver and bulb apparatus contained a measured quantity of sulphuric acid of known strength for the reception of the ammonia given off during the process of distillation. The contents of the retort were nearly distilled to dryness, and by this means the free or volatile carbonate of ammonia was distilled over with water only, and received into sulphuric acid. It is hardly necessary to observe that a portion of the acid becomes neutralised by the ammonia, and that by employing a fixed quantity of sulphuric acid, and a standard solution of caustic soda, the exact amount of ammonia given off during the distillation can be readily determined by the well known alkalimetrical process.

The result was that the 3 samples furnished:—

	No. 1.	No. 2.	No. 3.
Ammonia	1·13	1·31	1·32

It thus appears that the proportion of free ammonia in these 3 samples of good Peruvian guano was little above 1 per cent. The preceding figures express the amount of caustic or free ammonia contained in the vapours that were received in the acid during the process of distillation. Guano, however, like all other putrefying nitrogenous substances, does not furnish ammonia free or caustic, but as a carbonate; this carbonate is often in common life miscalled free ammonia, in consequence of its being volatile and having the same smell.

In order to determine the amount of ammonia existing in the shape of urate, sulphate, and other salts, the residue from which the volatile carbonate of ammonia was distilled off with water, was mixed with quick lime, some caustic soda, and a fresh quantity of distilled water, and after the acid in the receiver and bulb apparatus had been renewed, the contents of the retort were distilled nearly to dryness.

The following were the results obtained :—

	No. 1.	No. 2.	No. 3.
Percentage of ammonia present as salts of ammonia	5·41	5·53	4·91

Adding the ammonia which occurred in these samples as volatile carbonate to that existing in the shape of non-volatile salts, we get in the first sample 6·54, in the second 6·84, and in the third 6·23 per cent. of ready-formed or actual ammonia; and as the total amount of ammonia to be furnished on ultimate decomposition amounted to 18½ per cent. in round numbers, it will be seen that in good samples one-third of the total amount of ammonia which guano is capable of yielding is actual, and two-thirds potential ammonia, or, more correctly speaking, one-third of the nitrogen exists in ready-formed ammonia, and two-thirds in the form of uric acid, guanine, and other organic matters which readily yield ammonia on decomposition.

The proportions of volatile and of fixed but ready-formed ammonia vary considerably in different samples.

In dry and first-rate samples the ready-formed ammonia seldom exceeds 6½ to 7 per cent.; the ammonia in a volatile condition usually amounts to ½ or ¾ per cent. In wet or damaged samples, on the other hand, the proportion both of volatile ammonia and of ready-formed but fixed ammoniacal salts is more considerable. The following determination indicates this difference.

Percentage of free Ammonia in—

1. A dry good sample	·573
2. Ditto	·894
3. Ditto	1·309
4. Ditto	1·474
5. Damaged guano	1·891
6. Ditto	1·820
7. Ditto	2·748

There was but little of a pungent smell in the 4 good samples; the 3 damaged specimens had a strong smell of ammonia. In No. 7 the amount of fixed ammonia was 9·944 per cent., which is considerably more than is found in some good guano. It follows from these remarks that a powerful pungent smell, to a certain extent indicates inferior quality.

The Solubility of Phosphates in Guano.

Genuine Peruvian guano contains from 22 to 24 per cent. of earthy phosphates; but since the action of rain or other deteriorating influences removes the soluble constituents, the proportion of insoluble or earthy phosphates is larger in inferior samples.

The earthy phosphates occur in guano in a finely divided condition, in which they are no doubt more valuable than they would be in the shape of a coarse powder; but several direct determinations have shown me that they are not more soluble than good bone-dust.

In two experiments which I made, I found that 1 gallon of water dissolved respectively 2·46 and 2·64 grains of phosphate of lime.

In addition to insoluble phosphate of lime and magnesia (bone-earth), guano, it will be seen by the preceding analyses, contains soluble phosphoric acid in considerable though varying quantities. The soluble phosphoric acid occurs naturally as phosphate of ammonia, which, according to the usual way of performing an analysis, is classed with the alkaline salts. As this phosphoric acid is a most valuable constituent, it ought always to be determined when it is desired to ascertain correctly the money-value of guano. On an average I find in Peruvian guano a quantity of soluble phosphoric acid, which corresponds to 5 to 6 per cent. of bone-earth.

Alkaline Salts.—In considering the value of Peruvian guano, the fact that it contains potash ought not to be overlooked.

On an average good samples contain from 6 to 8 per cent. of alkaline salts, and, according to Professor Way, nearly one half of their weight consists of potash.

This constituent may contribute a good deal to its value as a manure for root-cops grown on light land deficient in potash.

Salt does not fix Ammonia.

Various means of increasing the efficacy of guano have been from time to time recommended, amongst others the addition of salt; and there can be no doubt of the propriety of such an admixture. The grounds on which its recommendation was based are, however, mistaken, because the beneficial effect certainly does not arise from any power which salt is supposed to possess of fixing the ammonia. Any one, who possesses even a slight acquaintance with chemistry may readily ascertain experimentally the amount of free ammonia contained in solutions or dry substances, and may satisfy himself that free ammonia is neither increased nor diminished by the addition of salt in small or large quantities. It is strange how generally the opinion has

been received which ascribes to salt this power. The explanation of this mistaken notion no doubt lies in the fact that salt is an excellent antiseptic, and consequently prevents the further decomposition of nitrogenous organic matters, and with it the further formation of ammonia, but it does not fix any existing free ammonia. Free ammonia in a substance soon escapes, and since, by the use of salt, further decomposition is effectually stopped, and the pungent smell which accompanies it is no longer perceptible, it is easy to conceive how salt should have received credit for being a fixer of ammonia.

In proof of the supposed value of common salt as a fixer of ammonia the following experiments of M. Barral, editor of the "Journal d'Agriculture Pratique," are quoted:—M. Barral took samples of guano; the one he kept pure, the other he mixed with an equal weight of common salt. The sample of pure guano was found on analysis to contain 12·56 per cent. of nitrogen; the sample mixed with salt contained 6·23 per cent., or as nearly as possible half the quantity of nitrogen. Equal weights of the two samples were exposed to heat for three hours in the same stove, in a current of air, maintained at 212° Fahr. They were spread out so as to have the same thickness, and occupy an equal surface, and they had been equally pulverised. At the end of three hours, on examining the two samples, the pure guano had lost 5·1 per cent. of its nitrogen, while the mixture had lost only 1·9 per cent.

This experiment, which appeared to be in favour of the preservative power of salt, was repeated under another form. Equal weights of the pure and the mixed guano were left in the open air, in plates, during fifteen days. At the end of that time the amount of nitrogen was determined in each sample, and it was found that the pure guano had lost 11·6 per cent. of its nitrogen, while that mixed with salt had lost only 5 per cent. Independent of the influence of salt in these experiments is the important fact that in this case upwards of one-tenth of the nitrogen was lost in the course of fifteen days. It will be observed that the guano here used contained only 12·56 per cent. of nitrogen, that is, a quantity much smaller than occurs in genuine sound Peruvian guano. It appears to me, therefore, likely that the guano was not of the best description, but probably a sample in an actual state of decomposition. Such samples yield ammonia constantly as a product of decomposition of the nitrogenous matters, and the addition of salt had not the effect of fixing any free ammonia, but by checking decomposition, it prevented the further formation and loss of ammonia. The correctness of this view appears clearly from the following experiments, which I made in the hope of confirming M. Barral's observations.

A sample of good Peruvian guano, which furnished a quantity of nitrogen corresponding to 17·24 per cent. of ammonia, and contained 12·82 per cent. of moisture, was dried in a current of hot air for three hours at a temperature of 212° Fahr. The ammonia driven off with the watery vapours was carefully collected in a bulb-apparatus containing hydrochloric acid, and the amount determined in the usual way with bi-chloride of platinum. At the end of 3 hours it was found to have lost ·75 per cent. of ammonia.

A second sample of the same guano was mixed with an equal weight of common salt, and submitted to the same process. The mixture contained 11·20 of moisture, and furnished on combustion with soda-lime 8·73 per cent. of ammonia, or as nearly as possible half the quantity which was found in the pure guano. At the end of 3 hours' drying in a current of air at 212°, the loss in ammonia was determined and found to amount to ·40 per cent.

The pure guano, it will be seen, lost no more ammonia than the sample mixed with 50 per cent. of salt.

Dried at 212° Fahr., the pure guano furnished altogether 19·77 per cent. of ammonia, and the mixed sample 9·83 per cent.

Equal weights of the pure and mixed guano were now exposed to the open air, in plates, during one month. At the end of that time the percentage of moisture, free ammonia, and total amount of nitrogen, calculated as ammonia, were determined in precisely the same way as before. The pure guano then contained 17·65 per cent. of moisture, ·69 of free ammonia, and on combustion with soda-lime furnished altogether 16·30 of ammonia. The mixture of equal parts of salt and guano after a month's exposure to air contained 19·69 per cent. of moisture, ·31 of free ammonia, and yielded altogether 7·94 per cent. of ammonia. Calculated in a perfectly dry state, the pure guano produced 19·73 of ammonia, and the mixed sample 9·88, or almost exactly the same quantities which both samples yielded before exposure to the air.

Notwithstanding the absorption of moisture during a month, neither the pure nor the mixed guano lost any ammonia. The absorption of moisture by the pure guano, it will be remarked, amounted to nearly 5 per cent., and that by the mixed sample to 7 per cent.

These results, arranged for the sake of greater perspicuity in the following tabular form, show at a glance that genuine Peruvian guano loses but an insignificant proportion ($\frac{3}{4}$ per cent.) of ammonia by long exposure to air at the ordinary temperature, or by drying in a current of air of the temperature of boiling water, and that therefore salt did not in these experiments exercise any chemical action.

Guano and Salt Experiments.

	Before exposure to Air.		After exposure to Air for 1 Month.	
	Pure Guano.	50 per Cent. of Guano, and 50 per Cent. of Common Salt.	Pure Guano.	50 per Cent. of Guano, and 50 per Cent. of Common Salt.
Percentage of moisture	12·82	11·20	17·65	19·69
Percentage of ammonia driven off with moisture at 212° Fahr. ..	·75	·40	·69	·3[illegible]
Percentage of total amount of nitrogen of the guano in natural state	14·19	7·19	13·42	6·5[illegible]
Equal to ammonia	17·24	8·73	16·30	7·9[illegible]
Percentage of total amount of nitrogen calculated for substance, dried at 212° Fahr.	16·28	8·10	16·25	8·1[illegible]
Equal to ammonia	19·77	9·83	19·73	9·88

The same guano which was used in the preceding experiments was kept for a period of more than a year, and then analysed; it then yielded the following results:—

Moisture	16·593
*Organic matter and ammoniacal salts	52·311
Phosphates of lime and magnesia (bone-earth)	22·273
Alkaline salts	7·380
Insoluble siliceous matter (sand)	1·443
	100·000

*Containing nitrogen	13·60
Equal to ammonia	16·52
Percentage of nitrogen in perfectly dried guano	15·90
Equal to ammonia	19·31

It will be seen that even in so long a period the guano scarcely lost any ammonia; the total amount of nitrogen in the dried guano was 16·28 per cent. in the preceding year; now it is 15·90 per cent. The difference between the two determinations—·38 per cent.—is so small that it might fairly be regarded as a variation, which may occur in any two separate analyses of the same material.

It follows unmistakably from these experiments that good Peruvian guano may be kept for any reasonable length of time in a dry place (such as a dry shed), without losing any of its fertilizing properties, and that there is no need of resorting to chemical substances which are known to possess the property of fixing ammonia. The recommendation to cover up or mix it immediately after its delivery with some fixer or preserver of ammonia, therefore, possesses no practical value.

Damaged Guano.

:ase is different with damaged or wet guano. Such guano :ally in an active state of decomposition, and loses the nmonia the longer it is kept. When good guano is mois- ith water, it enters into an active fermentation in less hours, in consequence of which it rapidly loses ammonia. ıerefore, should be taken not to expose guano to rain, and tore it away on a damp floor or in an exposed shed.

peculiar smell of dry Peruvian guano, it has been observed is caused by a number of fatty acids derived from the of the food of the guano-birds. There are, however, many who, on noticing the more or less powerful smell emanat- n guano, farmyard manure, compost-heaps, and similar mat- re an indiscriminate apprehension of a loss of ammonia. ıctive state of putrefaction refuse matters of that kind cer- ;ive off ammonia, but when the process of putrefaction is lly arrested by desiccation, the further evolution of am- ceases, and the disagreeable smell of the refuse matter, not so pungent as before, still remains sufficiently unaltered r that animal matters may smell strongly and yet not lose monia.

ıy one doubts the truth of this assertion, let him drench le of ounces of Peruvian guano completely with dilute ic acid, and he will find that the characteristic smell of ıno is not removed or weakened by the acid. If the 'ere due to ammonia, the excess of acid would of course y saturate this volatile alkali, and destroy the smell. soaked in oil of vitriol may be dried and heated for hours mperature not exceeding 212° Fahr. without losing its r smell; though it is hardly necessary to say that at that ıture ammonia cannot escape from a dry and very acid

aged and wet guano should either be applied to the land delay, or if this is impossible, it should be dried before ored away. To this end the guano may be thinly spread y floor and be mixed with gypsum or a similar drying l. If sand or peat-mould or charcoal-dust is used, it : well to moisten it at the same time with some oil of liluted with an equal bulk of water, for the acid will fix : ammonia, which in wet guano amounts to 1½ to 1¾ per

mixture may be exposed with advantage to direct sun- be submitted to a moderate artificial drying heat, and if nnot be applied conveniently, the moist guano-mixture be turned over in a place exposed to a current of air.

Water as a Solvent for Guano.

It has been frequently noticed that Peruvian guano is no efficacious in a dry season or localities as in a wet season or in tricts where the rain-fall is high. This perhaps is one, but not only reason why Peruvian guano is so highly and justly ap ciated in the West of Scotland, and generally in the wes counties, and why in several of the eastern counties it has l superseded in a great measure by superphosphate of lime.

Again, it has been observed that Peruvian guano is never ı beneficially applied to the land than when a sufficient lengt time is allowed for the rain to wash it into the land. These similar observations tend to show that guano, like most hi concentrated manure, produces the most beneficial effect ı vegetation when it has become thoroughly acted upon by v and its constituent elements have been uniformly diffused thr the soil. That guano should be applied to the land at a when heavy showers of rain or a succession of wet days may fidently be expected, is a rule with all good farmers; a remains for the agricultural chemist to point out the reason this should be done, and also to explain why, on the same and upon the same crop, guano at certain times acts much beneficially than at others. The difference in the practical eff of Peruvian guano is intimately connected with the action of v on its constituents. A comparatively small quantity of v corresponding to a mere passing shower of rain falling on a recently manured with guano appears to have a different from that of a large downfall on its constituents; as this su has a direct practical bearing upon agricultural practice, I carefully studied the action of water upon guano, and now pr with a description of my experiments and a statement o results.

Experiments showing the effects of a definite and large quan of Water on Peruvian Guano.

The same three samples of guano, the composition of whi given in the beginning of this paper, were employed in the lowing experiments:—

100 grains of each sample were boiled up for a few mi with half a decigallon of distilled water, another half decig of cold distilled water was added, and the mixed and m liquid allowed to settle for 24 hours in a stoppered glass-b The clear liquid was then filtered off, and the insoluble n collected, on a weighed filter. The insoluble matter was in a waterbath, weighed, and then burned. In the burnt re the percentages of sand, insoluble phosphates, oxalate of

and alkalies were determined by approved analytical processes, and in the soluble portion, those of soluble bone-earth, oxalic, sulphuric, and phosphoric acid, of chlorine, potash, and soda. The percentages of nitrogen both in the solution and in the insoluble matter were also determined.

The following Table embodies the results of these determinations :—

	No. I. Per Cent.		No. II. Per Cent.		No. III. Per Cent.	
Portion soluble in water	57·01		48·92		48·01	
Consisting of:—						
Moisture		15·14		18·42		16·56
Tribasic phosphate of lime		·60		·48		·44
Phosphoric acid		2·62		2·34		2·38
Equal to tribasic phosphate of lime		(5·68)		(5·08)		(5.16)
Sulphuric acid		6·29		2·88		3·30
Oxalic acid		5·70		5·67		5·18
Chlorine		1·48		1·50		1·02
Potash		3·69		1·91		1·71
Soda		1·62		1·47		·86
*Ammoniacal salts and soluble organic matters		19·87		14·25		16·56
Portion insoluble in water	42·99		51·08		51·99	
Consisting of:—						
Insoluble phosphates		19·52		20·92		21·60
Oxalate of lime		·77		1·17		1·37
Potash and soda		·63		·61		·77
Insoluble siliceous matter (sand)		1·21		1·11		1·51
†Insoluble organic matters		20·86		27·27		26·74
		100·00		100·00		100·00
*Containing nitrogen		11·59		9·88		Not determined.
Equal to ammonia		14·07		11·98		
†Containing nitrogen		3·82		5·46		
Equal to ammonia		4·67		6·63		

A glance at the preceding analytical result shows :—

1. That a large proportion of Peruvian guano is soluble in pure water.
2. That a small quantity of bone-earth passed into the solution.
3. That Peruvian guano contains soluble phosphoric acid in combination with alkalies in considerable quantities.
4. That it contains also oxalic acid.

   On washing guano with water the oxalic acid in combination with ammonia passes into the solution as oxalate of ammonia.
5. That only a small amount of oxalic acid remained in the insoluble portion as oxalate of lime.
6. That the insoluble part of guano contained a little potash and soda.

It is not possible to wash these alkalies completely o of guano even where large quantities of boiling water a employed.

7. That by far the greater portion of the nitrogen contained the organic matters of guano is soluble in water, and the fore may be supposed to be present in a readily assimila state for the use of plants.

On burning, Peruvian guano leaves a perfectly white a which dissolves in hydrochloric acid without the least ef vescence. The amount of sulphuric acid in this ash is mu less than in the guano before it is burnt. The three samp in which I found before burning 3·52 per cent., 2·88 per ce and 3·30 per cent. respectively, gave ashes which contained o 1·29, 1·25, and 1·16 per cent. of sulphuric acid. As gu leaves only one-third of its weight, in round numbers, of ash is evident that by far the greater proportion of sulphuric a which it contains, is dissipated by burning.

In the next experiment I tried to exhaust Peruvian gu completely with water.

100 grains were boiled repeatedly with large quantities water, and the insoluble portion was washed upon a filter w distilled water for more than five days. Even after that tin little was dissolved, but as the washings then contained o a trace the exhaustion by water was discontinued, the insolu matter collected on a weighed filter, dried at 210°, weighed, then burned. The insoluble matter was analysed as bef The whole of the solution was exaporated to dryness, and residue, after drying at 212°, weighed and analysed.

During the evaporation of the large quantity of fluid ployed in exhausting the guano, ammonia was constantly given and as the complete evaporation and drying of the residue occup nearly a week, a large proportion of uric and other nitrogen compounds was destroyed and dissipated in the form of carbon of ammonia. It will be seen by the subjoined analysis that less than 33½ per cent. of organic matter were destroyed in way.

The guano analysed in the usual way, that is without exha ing it first with water, produced the following results:—

Moisture	15·90
Organic matter and ammoniacal salts *	53·73
Phosphates of lime and magnesia (bone-earth)	22·07
Alkaline salts	7·17
Insoluble siliceous matter	1·13
	100·00
*Containing nitrogen	15·74
Equal to ammonia	19·11

Nearly exhausted with water the same guano furnished the following proportions of soluble and insoluble matters:—

Percentage of soluble portion	74·89
Percentage of insoluble portion	25·11

Thus nearly three-fourths of the weight of the guano passed into solution, and one-fourth only was left behind insoluble. This portion we shall see presently consisted almost entirely of insoluble phosphates and insoluble siliceous matter.

The analysis of the soluble and the insoluble part gave the following results:—

Part soluble in water	74·89	
Consisting of:—		
Moisture		15·90
Tribasic phosphate of lime		2·92
Alkaline salts		6·91
Containing phosphoric acid		1·28
Equal to tribasic phosphate of lime		(2·77)
Soluble organic matters (left in dried residue on evaporating the watery solution)		14·42
Soluble organic matters (decomposed and resolved chiefly into ammonia compounds during evaporation)		33·46
Part insoluble in water	25·11	
Consisting of:—		
Insoluble phosphates		19·82
Oxalate of lime..		·56
Potash and soda		·77
Insoluble siliceous matter (sand)		1·36
Insoluble organic matter		2·60
		100·00

It is remarkable that the insoluble portion, notwithstanding that an immense quantity of water was passed through it, still contained some potash and soda, which it seems to have a great power of retaining. The phosphate of lime, which constitutes so large a part of the insoluble residuum, seems to have the power of forming with alkalies a chemical union which is broken up with great difficulty, and only very gradually, by boiling water.

The larger amount of bone-earth in this watery solution is accounted for by the large quantity of water used in the experiment. We have in this a direct proof that the insoluble phosphates in guano are rendered soluble by degrees by a sufficiently large quantity of water.

Combined Action of Sulphate and Oxalate of Ammonia.

Peruvian guano we have seen contains both sulphate and oxalate of ammonia. Liebig has shown that these two salts have an important function in rendering the insoluble phosphates

soluble. Insoluble phosphate of lime is more soluble in a liquid containing sulphate of ammonia than in pure water. When guano, therefore, is moistened with water, some of the insoluble phosphate, through the intervention of the sulphate of ammonia, becomes soluble, but as oxalate of ammonia is also present in solution, the oxalic acid forms with lime an insoluble salt, the phosphate of lime thus rendered soluble becomes changed into oxalate of lime, and phosphoric acid passes into solution. This action is slow, and its effects are therefore more marked when guano is kept for a considerable length of time thoroughly soaked with water.

With a view of ascertaining whether or not the insoluble phosphates in guano really become more soluble under the influence of sulphate and oxalate of ammonia, the following experiments were made. A weighed quantity of good Peruvian guano was exhausted at once with a large quantity of distilled water, and the matter insoluble in water collected on a filter and washed for a long time until very nearly all soluble matters were removed.

The guano furnished—

Matters soluble in water	74·25 per cent.
Matters insoluble in water	25·75 „

It contained—

Water	16·57 „

and yielded on combustion with soda-lime—

Nitrogen	15·71 „
Equal to ammonia	19·09 „

In the portion soluble in water I found—

Phosphoric acid	3·13
Equal to tribasic phosphate of lime (bone-earth)	6·78

In the insoluble part there was—

Tribasic phosphate of lime	18·27
Oxalate of lime	·85

A second weighed quantity of the same guano was mixed with a little water and left for two days in a glass, after which time it was completely exhausted with distilled water like the first quantity. It produced—

Substances soluble in water	74·44 per cent.
Substances insoluble in water	25·56 „

In the soluble portion I found—

Phosphoric acid	3·66 „
Equal to tribasic phosphate of lime	7·94 „

The insoluble portion contained—

Tribasic phosphate of lime	17·58

We thus see that by moistening guano with water and leaving t for two days in this condition before extracting it with water, a small quantity of the insoluble phosphates was rendered soluble and passed into solution. The effect produced in the course of two days, however, was inconsiderable. A large quantity of the same guano therefore was drenched with water and kept in a wide-mouthed open bottle for three weeks. After 24 hours it gave off ammonia in abundance, and continued to do so during the whole time in which it was kept. At the end of three weeks a weighed quantity was exhausted with distilled water. It contained—

Moisture	34·84	per cent.

and yielded on combustion—

Nitrogen	9·48	"
Equal to ammonia	11·51	"

In the watery solution I found—

Tribasic phosphate of lime	1·53	"
Phosphoric acid	4·04	"
Equal to tribasic phosphate of lime	8·76	"

In the insoluble portion—

Insoluble tribasic phosphate of lime	14·10	"
Oxalate of lime	4·69	"

In order to bring out more clearly the changes which the guano underwent in the period during which it was kept in a moistened state exposed to the air, the preceding results were calculated as follows, so as to adapt them to the normal condition of the guano; when it contained 16·57 per cent. of water—

Moisture	16·57
Percentage of nitrogen	12·13
Equal to ammonia	14·73
Tribasic phosphate of lime in watery solution ..	1·96
Phosphoric acid in watery solution	5·10
(Equal to tribasic phosphate of lime	11·06)
Insoluble tribasic phosphate of lime	18·05
Oxalate of lime	6·00

These results compared with the original analysis show unmistakably the injury which the guano sustained when kept in a thoroughly wet state for three weeks. The percentage of nitrogen has been reduced from 15·71 (equivalent to 19·07 per cent. of ammonia) to 12·13 (equivalent to 14·73 per cent. of ammonia).

During the active fermentation, into which moistened guano rapidly enters, a portion of its organic constituents is changed into carbonate of ammonia, which gradually evaporates; at the same time oxalic acid is produced; this acid acts upon the insoluble phosphates and renders a portion soluble. The decomposition of a portion of the organic matter and the subsequent loss of ammonia fully accounts for the larger amount of phosphates which occurs in samples of damaged guano. In the case

before us the guano sustained a loss of 3·58 per cent. of nitrogen, equal to 4·34 per cent. of ammonia, in the short period of three weeks, and as the loss increases with the length of time during which it is kept in a wet and fermenting condition, it is hoped no further argument is required to induce agriculturists to store Peruvian guano in a perfectly dry place, and to take care either to apply damaged guano at once to the land or, if that may not be done, to dry it.

The dissipation of organic matter necessarily raised the total percentage of phosphates, which rose from 25·05 per cent. of soluble and insoluble phosphates, calculated as tribasic phosphate of lime, to 31·07 per cent., being an increase of 6 per cent.

By far the larger proportion of the increase in phosphates, it will be seen, makes its appearance in the watery solution of the fermented guano. That the insoluble phosphates are rendered soluble, at least in part, through the joint action of sulphate and oxalate of ammonia on the earthy phosphates, appears evidently from the considerable proportion (6 per cent.) of oxalate of lime which was found in the fermented sample.

Moistening guano with water previous to use, although it increases the solubility of the phosphates, cannot be recommended, because this effect is attended with a loss of a great deal of ammonia.

Use of Sulphuric Acid.

The insoluble phosphates may, however, be rendered soluble more perfectly by a little sulphuric acid without any loss of costly nitrogen; a quantity too small to give an acid reaction to the guano producing a most decidedly beneficial effect upon the insoluble phosphates.

Treated with only 5 per cent. of oil of vitriol, guano yields, as we shall see presently, quite half its amount of phosphoric acid to water; whilst without such treatment scarcely one-fifth of its phosphoric acid occurs in a soluble state.

The peculiar action of sulphuric acid upon guano is due to the presence of oxalate of ammonia and to the sulphate of ammonia which is then formed. With a view of studying experimentally the effect produced by very moderate additions of oil of vitriol, and of ascertaining in what proportions it should be added, I tried the following experiments:—

Four small quantities of good Peruvian guano were severally mixed with 5, 10, 15, and 20 per cent. of oil of vitriol ($S\,O_3$, $H\,O$), and the mixture dried on the top of a waterbath, after which a weighed quantity was very nearly exhausted with distilled water. The soluble and insoluble portions were then in each case analysed separately. The guano employed in these four experiments contained in 100 parts—

Moisture	13·27
*Organic matter and salts of ammonia	54·68
Phosphates of lime and magnesia (bone-earth)	23·33
†Alkaline salts	7·28
Insoluble siliceous matter	1·44
	100·00
*Containing nitrogen	15·50
Equal to ammonia	18·82
†Containing phosphoric acid	2·33
Equal to tribasic phosphate of lime	5·05

his guano contained 5·87 per cent. of ammonia in the state of mmoniacal salts.

The addition of 5 per cent. of oil of vitriol imparted only a ery faint acid reaction to the guano, thus showing that the acid lid not act at once on the insoluble tribasic phosphate of lime.

With 10 per cent. of oil of vitriol a decidedly acid solution as obtained, and with the larger proportions of acid of course is effect was still more decided.

Composition of Peruvian Guano dried with 5 per cent. of Oil of Vitriol (SO_3, HO).

Water driven off on long drying at 212° Fahr. ..	4·63	Percentage soluble in water, 62·87.
Bi-phosphate of lime	1·36	
Equal to bone-earth, rendered soluble by acid ..	(2·12)	
Sulphate of lime	1·84	
Alkaline salts	11·13	
Containing phosphoric acid	(6·46)	
Equal to tribasic phosphate of lime	(13·99)	
*Soluble organic matter and salts of ammonia	43·91	
†Insoluble organic matter	8·38	Percentage insoluble in water, 37·13
Insoluble phosphates	14·70	
Oxalate of lime	12·37	
Insoluble siliceous matter	1·68	
	100·00	
*Containing nitrogen	11·44	
Equal to ammonia	13·88	
†Containing nitrogen	3·66	
Equal to ammonia	4·45	

The preceding figures suggest the following remarks :—

1. The small addition of 5 per cent. of oil of vitriol had the fect of rendering fully one-half or the phosphates soluble in ater. For the total percentage of phosphate amounted to 30·81. n this quantity we have—

Soluble in water :—	
Bi-phosphate of lime, calculated as tribasic phosphate of lime	2·12
Phosphoric acid in combination with alkalies, calculated as tribasic phosphate of lime	13·99
Soluble phosphates, calculated as tribasic phosphate of lime ..	16·11
Insoluble phosphates	14·70
Total amount of phosphates	30·81

Before treatment this guano contained 28·38 per cent. of phosphates, and in this quantity only 5·05 per cent. in a soluble state, and 23·33 per cent. as insoluble phosphates. These figures show the great utility of mixing guano with a little oil of vitriol. The acid not only fixes any free carbonate of ammonia (which in damaged or in wet guano may amount to more than 1¾ per cent.), but it has also the more important effect of rendering soluble a large proportion of the insoluble phosphates.

2. When guano is exhausted merely with water, the portion insoluble in water is found on analysis to contain very little oxalate of lime; in that case nearly the whole of the oxalic acid in guano remains in the watery solution. But when guano is dried with only 5 per cent. of sulphuric acid, nearly the whole of the oxalic acid is left behind as oxalate of lime in the portion insoluble in water, and an equivalent proportion of phosphoric acid is liberated from the insoluble phosphates and passes into solution in combination with ammonia and potash.

3. It will be noticed that, of the total amount of nitrogen in this sample of sulphated guano, three-fourths is present in a state soluble in water, and only one-fourth is insoluble. There can, however, be no doubt that these insoluble nitrogenous compounds become readily transformed into soluble combinations, which are easily assimilated by plants.

Composition of Peruvian Guano dried on a Waterbath with 10 *per cent. of Oil of Vitriol* (SO_3, HO).

Water given off on long drying at 212° Fahr.	4·58	Percentage soluble in water, 65·59.
Bi-phosphate of lime	1·51	
Equal to bone-earth rendered soluble	(2·37)	
Sulphate of lime	2·09	
Alkaline salts	10·96	
Containing phosphoric acid	(7·09)	
Equal to tribasic phosphate of lime	(15·36)	
*Soluble organic matter and salts of ammonia	46·45	
†Insoluble organic matter	7·28	Percentage insoluble in water, 34·41.
Insoluble phosphates	12·24	
Oxalate of lime	13·33	
Insoluble siliceous matter	1·56	
	100·00	

*Containing nitrogen	12·00
Equal to ammonia	14·57
†Containing nitrogen	3·43
Equal to ammonia	4·16

As might have been expected, the guano by the addition of 10 per cent. of acid is rendered slightly more soluble than by 5 per cent.

The effect produced by the larger amount of acid, however, is scarcely commensurate to the increase of acid; for, with 10 per

:id only 1¾ per cent. more of soluble phosphates were he guano than with 5 per cent. in these two instances. be seen that the proportion of bi-phosphate of lime is e same, but that the phosphoric acid in combination ies was rather larger when more acid was used. whole, the additional 5 per cent. of sulphuric acid were ded to much advantage.

position of Guano dried with 15 *per cent. of Oil of Vitriol* (SO_3, HO).

driven off on long drying at 212° Fahr. ..	4·77	Percentage soluble in water, 67·68.
sphate of lime	2·74	
al to bone-earth render soluble	(4·28)	
te of lime	3·74	
ıe salts	11·02	
aining phosphoric acid	(7·11)	
al to tribasic phosphate of lime	(15·40)	
ɔ organic matter and salts of ammonia	45·41	
ɔle organic matter	10·37	Percentage insoluble in water, 32·32.
ɔle phosphates	8·23	
e of lime	12·23	
ɔle siliceous matter	1·49	
	100·00	
taining nitrogen	12·07	
qual to ammonia	14·66	
taining nitrogen	2·34	
qual to ammonia	2·83	

king over these results, it will be seen that the solubility ıano is again increased by the additional quantity of

oportion of bi-phosphate of lime is greater than in the eated with 10 per cent. of acid, but the amount of soluble ic acid combined with the alkalies is about the same in s.

ponding with the proportion of soluble phosphoric acid alies, the amount of oxalate of lime in this experiment about the same as in the preceding one.

it will be seen that the nitrogenous matter is made ıble by the larger amount of sulphuric acid.

be noticed that the solubility of the guano is still further , so that only 26¾ per cent. remained insoluble in water. lditional quantity of sulphuric acid acted upon the inhosphates; about 8 per cent. were rendered soluble, and r cent. were left in an insoluble state.

be inferred from this experiment that 25 per cent. of iol, or one-fourth the weight of the guano, would have the whole of the phosphates, and nearly the whole of the us matter, perfectly soluble in water.

Composition of Guano dried with 20 per cent. of Oil of Vitriol (SO_3, HO).

Water driven off at 212° Fahr.	5·44	Percentage soluble in water, 73·24.
Bi-phosphate of lime	5·36	
Equal to tribasic phosphate of lime	(8·37)	
Sulphate of lime	7·31	
Alkaline salts	10·54	
Containing phosphoric acid	(6·68)	
Equal to tribasic phosphate of lime	(14·47)	
*Soluble organic matter and salts of ammonia	44·59	
†Insoluble organic matter	9·50	Percentage insoluble in water, 26·76.
Insoluble phosphates	3·06	
Oxalate of lime	12·97	
Insoluble siliceous matter	1·23	
	100·00	

*Containing nitrogen	3·01
Equal to ammonia	3·65
†Containing nitrogen	10·59
Equal to ammonia	12·86

In all the four trials, with 5, 10, 15, and 20 per cent. of acid, the amount of soluble phosphoric acid in the alkalies and of oxalate of lime in the part insoluble in water differed but inconsiderably.

By the agency of oxalic acid, naturally present in the guano, assisted by only 5 per cent. of sulphuric acid, a very large proportion of the insoluble phosphates are thus rendered soluble in water; and the larger quantities of acid were expended in the foregoing experiments with far less economical advantage than the first 5 per cent.

On the strength of these experiments, I would strongly recommend the addition of about 5 per cent. of oil of vitriol to guano as a cheap and ready means of greatly increasing its efficacy. The expense of so small a quantity of acid is too trifling to require a moment's consideration. Some difficulty, however, I anticipate may be felt in incorporating the acid uniformly with the guano. As the proportion of acid to that of the guano is very small, an intimate mixture cannot be effected by simply pouring the acid upon the latter, nor is it desirable to use the acid in a concentrated state.

Practical Directions.

I would therefore suggest the following plan:—In the first place, dilute the oil of vitriol with about an equal bulk of water, and then sprinkle the dilute acid over dry sawdust, or, if that cannot be had, over ground gypsum or sand. Dry sawdust takes up a great deal of liquid without appearing particularly wet. Gypsum or sand do not take up so much liquid, and

must be used in sufficient quantities to absorb completely the acid. By thoroughly mixing the guano, previously reduced to fine powder with sawdust, gypsum, or sand, slightly wetted by the acid, both may be intimately incorporated with each other.

We have seen in the preceding pages that the efficacy of Peruvian guano may be greatly increased by improving its mechanical conditions, also by the addition of common salt, and especially by treatment with a small quantity of oil of vitriol. I am convinced if the suggestions which I offer are carried into practice, a considerable saving in the expense of the guano will be realized, for it will then be applied to the land in an improved mechanical condition and in a state of increased chemical efficacy.

12, *Hanover Square, London, W.,*
February 1864.

VII.—*Report on International Agricultural Meeting at Lille.*

At the Meeting of the Council of the Royal Agricultural Society, on 1st April, 1863, it was resolved (on the invitation of the municipal authorities of the city of Lille and of the Prefect of the Department) that "Sir A. K. Macdonald and Professor Wilson be deputed to attend on the Jury on Agricultural Implements at the forthcoming International Exhibition near that town." In obedience to this resolution we attended the meeting, and now beg to submit to the Council the following brief Report of its principal features, and of the duties we were invited to take part in.

In France the department of agriculture forms a prominent feature of the imperial executive, and each year great meetings or shows are held, at which large sums of money are expended in promoting improvements in the various processes of stock and tillage husbandry. For this purpose the country has been divided into distinct districts (*régions*), in each of which a competitive agricultural exhibition (*concours régional agricole*) is held each year, under the direction and personal superintendence of an officer (*Inspecteur-Général d'Agriculture*), appointed by the Minister of Agriculture for that special service. At these meetings the exhibitors are, as a rule, confined to those farmers and others residing within the districts specified; and in no case hitherto had these meetings assumed anything of a national, much less of an international character, by the admission of strangers as competitors in the exhibition.

On the present occasion the district referred to comprised the

following departments:—L'Aisne, le Nord, Pas de Calais, la Somme, l'Oise, Seine et Marne, Seine et Oise, and la Seine; and the city of Lille, the capital of the "Département du Nord," was fixed upon for the meeting. The locality was well adapted for the introduction of the new element of competition—the admission of foreign exhibitors to the meeting. The accommodation both for exhibitors and their stock was ample and well arranged, while the railway and general facilities of transport placed it readily within reach of the countries most likely to take advantage of the invitation of the authorities. These were, however, as might be expected, limited both as to nations and as to numbers of exhibitors, Belgium, Holland, and Great Britain being the only countries represented; the two former chiefly contributing specimens of their various breeds of stock; while our entries were confined entirely to machinery and implements.

In addition to the competition between the exhibitors of stock and of implements the annual "Prize of Honour" had to be awarded "to the agriculturist of the department (du Nord) whose "*exploitation*" compared with other rural properties in the department should be considered the best managed, and where the improvements carried out were of the most useful character, and such as were desirable as examples to others." This prize, which is open to all persons farming within the department, consists of a sum of 5000 francs (200*l.*) in money and of a silver cup of the value of 3000 francs (120*l.*); besides which the jury has the power of awarding a sum of 500 francs (20*l.*), three silver medals, and three bronze medals, to the persons employed on the property who have aided in carrying out the improvements.*

The Show was held on the esplanade in front of the citadel. The arrangements for the exhibition of the stock were very tasteful and complete, long ranges of roomy sheds being prepared for their reception. For a small proportion of the machines, &c., shed accommodation was afforded; the rest was arranged along the alleys of the esplanade.

The duties assigned to us by the administration were to assist in the examination and adjudication of awards to the machinery and implements. For the purposes of division of labour and economy of time the machinery department was divided into two classes the one comprising those machines, &c., used in the outdoor, the other those used in the indoor work of the farm; Professor Wilson was the English representative in the first, and Sir A. K. Macdonald in the latter division of the Jury. The awards in this department of the Show were confined to medals of gold, silver

* In vol. xxiv. p. 8, 'Royal Agricultural Society's Journal,' full details have been given of the working of these prizes in the different agricultural districts (*régions*) of France during the past year (1862.)

nze, with honourable mentions for exhibits of inferior In the stock classes sums of money, varying from cs to 600 francs, were given in addition to medals.

articles exhibited in the first class (for outdoor use) anged under the following heads :—

hs; subsoil-ploughs; harrows; rollers; scarifiers, culti- sowing-machines; horse-hoes; moulding-ploughs; mow- chines; haymaking machines; horse-rakes; reaping- s; farm-carts, waggons; farm-harness; manure-pumps; ; implements for manual use.

second class (for indoor use) comprised :—

nills; drain-tile making machines; draining-tools; horse fixed steam-engines; moveable steam-engines; fixed g and finishing machines; moveable threshing and finish- hines; fixed threshing and winnowing machines; move- reshing and winnowing machines; fixed threshing- s (simple); moveable threshing-machines (simple); eens; sieves and riddles; grain-crushing machines; ting machines; straw and chaff cutters; cooking-appa- churns; weighing-machines; instruments used in the in- erations of the farm.

arrangements for testing the powers and efficiency of these machines and implements were not so complete and satis- as those we are accustomed to find at our own great For the field-trials the area was too limited, and the t well suited to test fairly their capabilities.

Awards of the Jury which we venture to submit for were as follows. In the first division or class :—

—Messrs. Ransome and Sims	1st Prize, Gold Medal.
'loughs :—J. and F. Howard	1st Prize, Gold Medal.
:—J. and F. Howard	1st Prize, Silver Medal.
Ashby and Co.	Honourable Mention.
–A. E. Crosskill	1st Prize, Silver Medal.
Amies and Barford	Honourable Mention.
:—C. Clay	1st Prize, Silver Medal.
Coleman and Son	2nd Prize, Bronze Medal.
Underhill	Honourable Mention.
Machines :—Smith and Sons	1st Prize, Gold Medal.
,, Garrett and Son	1st Prize, Silver Medal.
,, Reeves	2nd Prize, Bronze Medal.
es :—Garrett and Son	1st Prize, Silver Medal.
Underhill	Honourable Mention.
g-Ploughs :—Underhill	1st Prize, Bronze Medal.
,, J. and F. Howard	Honourable Mention.
Machines :—Picksley and Co.	1st Prize, Gold Medal.
,, Walter A. Woods	2nd Prize, Silver Medal.
ting-Machines :—Nicholson	1st Prize, Gold Medal.
,, J. and F. Howard ..	2nd Prize, Silver Medal.
,, Ashby and Co.	Honourable Mention.
,, Boby	Honourable Mention.

Horse-Rakes :—Nicholson	1st Prize, Silver Medal.
" Ransome and Sims	2nd Prize, Bronze Medal.
Reaping-Machines :—Bamlett	1st Prize, Gold Medal.
" Ransome and Sims	2nd Prize, Silver Medal.
" W. A. Woods	3rd Prize, Bronze Medal.
Carts and Waggons :—Crosskill	1st Prize, Gold Medal.
" "	2nd Prize, Silver Medal.
Tools, &c., for manual use ;—Picksley and Co. ..	1st Prize, Silver Medal.

In the second division or class :—

Pugmills :—Whitehead	1st Prize, Silver Medal.
Horse Works :—Ransome and Sims	1st Prize, Gold Medal.
" Picksley and Co.	2nd Prize, Silver Medal.
Steam-Engines :—Ransome and Sims	1st Prize, Gold Medal.
" Ruston and Proctor	2nd Prize, Silver Medal.
" Garrett and Son	3rd Prize, Bronze Medal.
" Underhill	Gold Medal.
Threshing and Finishing-Machines :—Ransome and Sims	1st Prize, Gold Medal.
Threshing and Finishing-Machines :—Ruston and Proctor	2nd Prize, Silver Medal.
Threshing and Finishing-Machines :—Turner ..	3rd Prize, Bronze Medal.
Screens :—Boby	1st Prize, Silver Medal.
" Ransome and Sims	2nd Prize, Bronze Medal.
Riddles, &c. :—Boby	1st Prize, Silver Medal.
" Nalder	2nd Prize, Bronze Medal.
Grain-Crushers :—Turner	1st Prize, Silver Medal.
" Ransome and Sims	2nd Prize, Bronze Medal.
" Picksley and Co.	Honourable Mention.
Root-Cutters :—Picksley and Co.	1st Prize, Silver Medal.
" Ransome and Sims	2nd Prize, Bronze Medal.
Straw-Cutters :—Picksley and Co.	1st Prize, Silver Medal.
" Ashby and Co.	2nd Prize, Bronze Medal.
" Ransome and Sims	Honourable Mention.
Cooking-Apparatus :—Amies and Barford	1st Prize, Silver Medal.
Churns :—Eastwood	1st Prize, Silver Medal.

A Bronze Medal was also awarded to G. Bower for his arrangement of gas-works suitable to farm-establishments.

This list of awards will show how large a share of the prizes at the disposal of the Jury fell to our own countrymen. The various articles exhibited, though fairly upholding the character of their respective countries, offered no novelty of arrangement or manufacture, and call for no further remark from us.

In addition, however, to the general list, a "special prize" was offered for "steam-ploughs or cultivators." This we understood to have been given by the city of Lille, *although we had no official information as to the amount of the prizes or the conditions under which they were to be awarded.*

Two competitors appeared in the field, one French and the other English. France was represented by M. Kienzy, with his "locomotive cultivator," and England by the Messrs. Howard, with their improved arrangement of "steam traction-ploughs."

The latter is too well known to need any special remark; the former, however, we cannot pass over so readily, as it appeared to us to possess, in its mechanical arrangement, more of the elements of success than we have hitherto met with in the machines of this class which have been from time to time exhibited in England.

The working parts forming the cultivator, or digger, were attached to the hind part of an ordinary field locomotive-engine. The engine, of 8-horse power, with double cylinders, was carried on four broad wheels; the two fore-wheels, guided from the hind plate by a long pinion-rod, formed the steerage; while the large driving wheels were actuated, separately, direct from the crank by toothed wheels. At the back, on each side of the hind plate, or platform, were tanks for carrying a small stock of fuel and of water. The accompanying woodcuts will explain the mode of arrangement and working of the cultivators; the five-cranked axle, on which they were fixed, being driven by a pitch-chain from the main shaft.

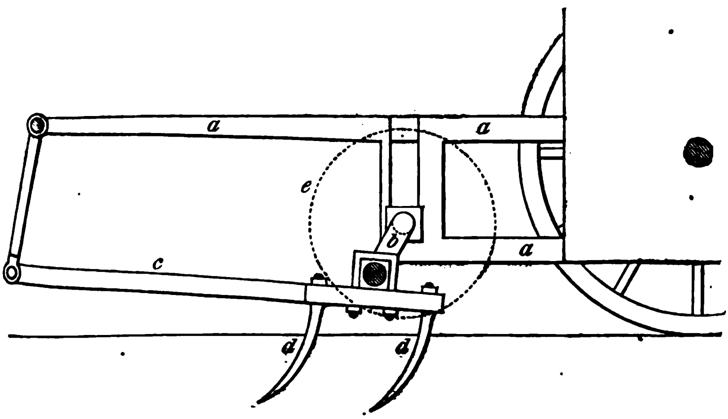


Fig. 1. Vertical Section of Working Parts.*

When the engine is in motion each revolution of the axle forces the tines into, and again withdraws them from the soil over which it passes, displacing the mass before them, and throwing it over that moved by the preceding cut. By a simple mechanical arrangement the cranked axle can be elevated or lowered, so as to suit the depth of work required, or to allow of the cultivator turning at the end of the lands.

* Owing to the failure on the part of the exhibitor to furnish working drawings of the cultivator as promised by him, the present have been drawn from memory, assisted by a rough sketch made at the time of the trials. They are, however, I believe, correct in every essential particular.—I. W.

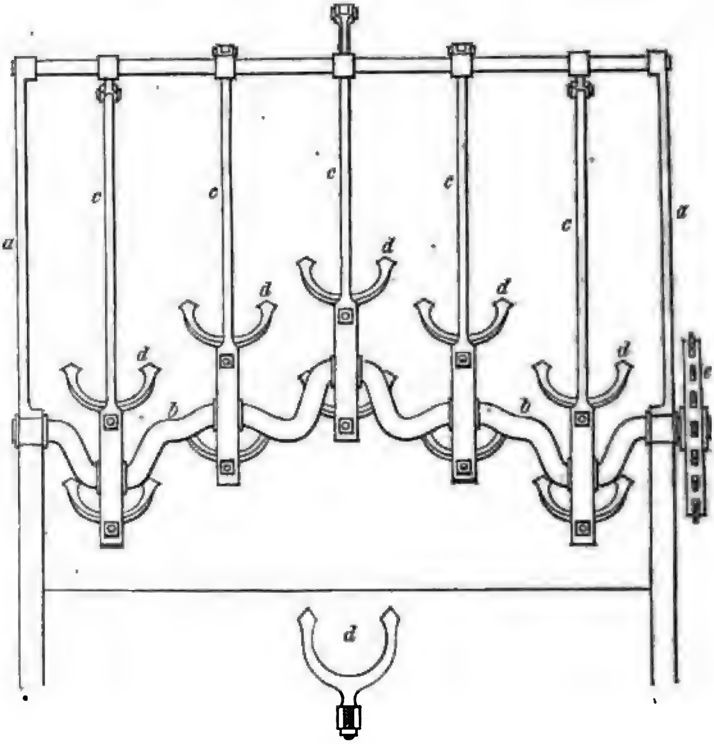


Fig. 2. Horizontal View of Working Parts.

Description of Working Parts of Cultivator.

a. Frame in stout bar iron attached to hind platform of engine.
b. 5-cranked axle, with 6-inch throw.
c. Lever arms carrying digging-tines, bolted on to cranks and attached by swinging bars at end to frame (*a*).
d. Digging-tines, 2-pronged with broad flat blades, fixed one before and one behind the crank.
e. Driving-wheel of axle actuated by pitch-chain from main shaft of engine.

The surface operated upon was 1·75 *mètres* (equal to 5 ft. 8 in.) in width, being a few inches on each side beyond the tracks of the driving wheels. The soil of the trial-ground was a deep alluvial loam, of moderate tenacity, but strongly matted together on the surface by a vigorous growth of couch (principally *Agr. stolonifera*), and other natural grasses. The subsoil was in a very indurated condition, thus presenting some difficulties, and offering considerable resistance to steam-cultivation. The engine was driven at the rate of sixty revolutions per minute,

with a steam-pressure of 80 lbs. to 90 lbs. The length of the furrow was about 60 *métres*, or 66 yards. The average time taken in passing over it was about three minutes, the work done was therefore at the rate of rather more than half an acre per hour. Owing to the driving wheels being moved independently of each other, the turning at the end of the furrows was accomplished very quickly, *i.e.*, in about sixty seconds, on the average. In the beginning of the trial the depth of soil cultivated measured from 25 to 30 *centimétres* (9·825 to 11·79 inches). The work was then set deeper, and a depth of fully 35 *centimétres* (13·755 inches) was obtained. The surface of the field, owing to heavy rains and a thick growth of old couchy grass, was in a condition far from favourable to the working of a "locomotive" cultivator. The engine, however, travelled readily over the appointed ground, and the soil was lifted, the sward fairly covered, a fine tilth obtained, and the ground operated upon left in a very satisfactory condition.

We have thought it desirable thus to give the details of this "locomotive cultivator or digger," inasmuch as although the engine as well as the working parts of the cultivator were of rather rough workmanship, and admitted in more than one point of mechanical improvement, the machine did its work without stoppages in a very satisfactory manner.

Hitherto the various attempts that have been made in this country to bring a *working* locomotive plough or cultivator into the field have been unsuccessful: Usher's at the Carlisle meeting, Rickett's at Chester; and Romaine's at Warwick and Leeds, having in each case failed to perform the work allotted to them, and being in consequence withdrawn from the competition. Without wishing to draw any comparison between the merits of the "locomotive" and the "steam-traction" systems of cultivation, we cannot but express an opinion, that, in regard to the comparatively small first cost of the apparatus, the low rate of its working expenses, including wear and tear, and the quality of the work performed,* the locomotive system of tillage still has claims upon our consideration, notwithstanding the failures of former attempts.

ARCHIBALD KEPPEL MACDONALD.
IOHN WILSON.

* "Messrs. Brown and May, of Devizes, worked Romaine's rotary cultivator or digging-machine on Plot 6. The work done, though but little, was certainly the best in the field, the soil being finely pulverized to the depth of 7 inches." Report of Judges of Steam Cultivators at the Leeds Meeting, 1861, 'Royal Agricultural Society's Journal,' vol. xxii. p. 464.

VIII.—*Report on International Agricultural Exhibition at Hamburg.* By IOHN WILSON, Professor of Agriculture in the University of Edinburgh, &c.

THE Great Exhibition of 1851 formed a memorable epoch in the history of most of our industries; in none have its important bearings and effects been more evident than in those connected with our agriculture. Before that period, it is true, the more advanced and enterprising agriculturists of the Continent from time to time had visited this country, become acquainted with our husbandry, and purchased our live stock and our implements; but it needed some great occasion like that which called together, in Hyde Park, the representatives of industry from all the civilized countries of the world to make that knowledge general, and its results productive of benefit both to our visitors and to ourselves.

At that International Exhibition the class of agricultural machinery excited the greatest interest. Each country had sent its best to meet beneath the same roof, and be compared with the best our own makers could turn out. All who went there learned a valuable lesson. We learned what our visitors' requirements were, and they had an opportunity of judging for themselves how far we were able to supply them. The stimulus then given to the manufacture of our agricultural machines, and its rapid and regular increase since, are too well known and too generally acknowledged to need any confirmatory evidence; the more widely our machines and implements are exhibited, and the more often they are tested by practical comparison with those of other countries, the better their real values are seen, and their superiority made known. For this purpose no combination of circumstances can be so favourable as that offered by an International Exhibition. By our own great annual meetings the market for our implements is extended from the different localities of manufacture to the furthest parts of the country; by an International Exhibition it is extended all over the cultivated world.

Since 1851 two great International Agricultural Exhibitions have been held,—both at Paris. The first, in 1855, was in connexion with the general Industrial Exhibition in that year; the other took place in the following year, and upon a larger and more comprehensive scale. To each of these Great Britain was a large contributor both of stock and implements, and carried off a full share of the prizes.

It would appear that the benefits resulting from these international gatherings are becoming each year more recognised; and other countries have since then proffered, either in whole

or in part, the same invitation that France gave in 1855 and 1856. Last year our agriculturists were invited to take part in three International Meetings—at Lille,* in France; at Odensee (Funen), Denmark; and at Hamburg. At the two first named, our contributions were limited to implements and machinery; but the Exhibition at Hamburg was upon such a large scale—so exceptional in its locality and in its character, and so satisfactory in its results—that the following sketch of its history, arrangements, and general details may not only be interesting, but also of advantage, if taken merely as a standard of comparison for future as well as past agricultural exhibitions, whether at home or abroad.

The territory of the Free State of Hamburg is very limited, and its direct interest in the promotion of agricultural industry reduced to the smallest proportions. Neither could the agricultural status of the neighbouring countries of Holstein, Mecklenburg, and Hanover be looked upon as of sufficient importance to have originated the great scheme undertaken by the citizens of Hamburg for its honour and advancement.

There is no doubt that, although not directly for her own wants, still indirectly for her own benefit, Hamburg is deeply interested in the development of the agricultural resources of Northern Germany. The Elbe is the great outlet for the surplus produce of her soil, and at the same time the entrance-gate for the admission of machinery for the better preparation of her produce, and of stock for the improvement of her farms. At Hamburg commerce exacts a toll from all that passes along her water highway, whether exports or imports; and her merchant citizens at once recognised the policy of a movement in the results of which, though not directly concerned, they would indirectly so largely participate.

The idea of an International Agricultural Exhibition appears however to have originated with Baron von Nathusius, of Hundisburg (Prussia), the President of the German Agricultural Society, well known here, as at home, for the lead he has taken for many years past in advancing the agriculture of his own country, by the introduction of improved breeds of stock, and improved implements and machinery. Hamburg offered by far the most advantageous site for such an Exhibition, not more from its geographical than from its political position. A free and neutral city, situated on a large tidal river, with lines of railway stretching far and wide throughout the length and breadth of Germany, all the local natural conditions for success were present; while the liberality and business habits of her merchants, unfettered by traditions or the established practices on such occasions, were likely to render the organization of such a meeting more com-

* See Report on the Lille Meeting at p. 209.

plete and more effective, than it would have proved if confided to the hands of any purely agricultural body. The suggestion of Baron von Nathusius was at once taken up by the citizens of Hamburg; a "guarantee fund" was subscribed for by sixty of the leading merchants, and an Executive Committee formed, under the presidency of the late lamented Baron Ernst Merck, through whose enlarged views and able and energetic management the idea increased in its proportions and its importance, until, when the gates were opened for the reception of visitors (July 14th), a representative Exhibition of productive industry, more comprehensive and more complete than had hitherto been seen, had been organised, and the outlay of an amount approaching to 20,000*l.* had been incurred.

The scheme of the Hamburg merchants met with the success it deserved: it was at once appreciated and accepted by all the principal countries on the Continent, whose leading agriculturists inscribed their names on the list of exhibitors. The following countries appeared as exhibitors:—Austria, Anhalt, Baden, Bavaria, Belgium, Brunswick, Canada, Denmark and the Duchies, Frankfort, France, Federal States of America, Great Britain, Hamburg, Holland, Hanover, Hesse Cassel, Hesse Darmstadt, Lippe, Lubeck, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Nassau, Oldenburg, Prussia, Russia, Saxony, Sweden and Norway, Spain, Switzerland, Uruguay, Venezuela, Wurtemburg.

The Exhibition was distributed among the usual departments for Stock, Implements, and Products; and to these the addition of a Flower Show afforded both relief and increased enjoyment to the numerous visitors. The stock was divided into Horse, Cattle, Sheep, and Swine classes. The horses were subdivided into 36 classes, containing 524 animals. The cattle classes were 71 in number, and consisted of 965 animals. The sheep classes were 29 in number, and contained 1766 animals. Those assigned to swine were 18 in number, and contained 293 animals. The Poultry numbered 321 specimens, which were classified merely as regards their genus. In the Machinery Department there were 350 exhibitors; and in that for agricultural products 527 exhibitors. To this large list Great Britain contributed in the following proportions—to the horses 67; to the cattle, 132; to the sheep, 400; to the swine, 89; or 688 head of live-stock in all. In the Machinery Section 73 Firms were exhibitors; and four British exhibitors sent in specimens of farm products. Thus the contributions from Great Britain amounted to 12·786 per cent. in the horse classes; in the cattle, to 13·782 per cent.; in the sheep, to 22·727 per cent.; in the swine, to 30·375 per cent.; in the machinery section, to 20·856 per cent.; and in the section of agricultural pro-

ıcts, to ·759 per cent. of the entire materiel of the Exhi- ition.

The successful competitors in the Horse Classes were—Mr. łroves, who took two prizes of the value of 200 thalers, or 30*l.*; [r. J. Crisp, who took six prizes amounting to 475 thalers, or l*l.* 5*s.*; Mr. Holmes, four prizes, 500 thalers, or 75*l.*; Mr. mith, one prize of 50 thalers, or 7*l.* 10*s.*; Mr. W. Wilson, one rize of 100 thalers, or 15*l.*; and Sir C. B. Phipps, who took ıree prizes of the value of 200 thalers, or 30*l.*

In the Cattle Classes the successful competitors were—

	Prizes.		Thalers.		£.	
Mr. D. Smith	6	amounting to	480	=	72	
Mr. J. Stewart	3	„	195	=	29	5
Mr. J. Crisp	3	„	350	=	52	10
M. J. Meikle	2	„	75	=	11	5
Lord Walsingham ..	1	„	100	=	15	0
Mr. E. Mertens	1	„	100	=	15	0
Mr. T. Barbe	1	„	50	=	7	10
Mr. J. Groves	1	„	100	=	15	0
Mr. T. Lyall	1	„	50	=	7	10
Mr. H. Gebhard	1	„	50	=	7	10
Mr. T. Coulson	1	„	70	=	10	10

The following received commendations:*—Lord Kinnaird, d Messrs. Sadler, J. Groves, Crisp, R. Smith, H. Gebhard, . Lyall, and D. Smith.

In the Sheep Classes the following prizes were awarded:—

	Prizes.		Thalers.		£.	s.
Lord Walsingham ..	4	amounting to	150	=	22	10
Mr. W. Hemming ..	3	„	65	=	8	15
Mr. W. Humphrey ..	2	„	75	=	11	5
Mr. E. Mertens	2	„	50	=	7	10
Mr. D. Smith	2	„	40	=	6	0
Mr. J. Groves	2	„	75	=	7	10
Mr. R. Smith	2	„	50	=	7	0
Mr. T. B. Marshall ..	2	„	100	=	15	0
Mr. W. Guerrier	1	„	50	=	7	10
Mr. J. Clarke	1	„	25	=	3	15
Mr. E. Handy	1	„	50	=	7	10
Mr. R. Garne	1	„	25	=	3	15
Mr. J. Gibson	1	„	50	=	7	10
Mr. R. S. Skirving ..	1	„	25	=	3	15
Lord Kinnaird	1	„	50	=	7	10

* The general term "commended" is here used; as the mode of wording the mmendations by the Juries was not only dissimilar in the different classes, but en in the same class. The following expressions used by the Juries each bear different signification:—"Anerkennung;" "Mit ehrenvoller Erwähnung;" Ruhmliche Anerkennung;" Auszeichnung;" "Ehrenwerthe Anerkennung;" Ehrenvoll Erwähnt wurden;" "Ehrenvolle Anerkennung fanden;" "Erwähnt urden;" "Anerkannt wurden;" "Lobend erwähnt wurden." These differ- ces in expression, as also the indistinct and inconspicuous method adopted of signating the prize animals, will no doubt be changed at any future Exhibition.

Commendations were awarded to — Messrs. Gebhard, W. Taylor, J. Druce, R. Smith, J. Groves, T. B. Marshall, R. Garne, T. B. Browne, E. Mertens, R. S. Skirving.

In the Swine Classes the following obtained prizes:—

	Prizes.		Thalers.		£. s.
Mr. T. Crisp..	6	amounting to	230	=	34 10
Mr. W. B. Wainman ..	6	"	200	=	30 0
Mr. J. Hickman	5	"	205	=	30 15
Mr. G. M. Sexton ..	4	"	110	=	16 10
Sir C. B. Phipps	1	"	25	=	3 15

Commendations were awarded to Mr. T. Crisp, Sir C. B. Phipps, Messrs. G. M. Sexton, J. Hickman, W. B. Wainman, R. Smith.

The aggregate money value of the prizes thus taken by British exhibitors was—for horses, 1525 thalers, or 228*l.* 15*s.*; for cattle, 1520 thalers, or 228*l.*; for sheep, 880 thalers, or 132*l.*; for swine, 770 thalers, or 115*l.* 10*s.*: in all, 4695 thalers, or 705*l.* 5*s.*

My colleagues on the Jury, Messrs. Weatherby, Barthropp, and Robert Smith, have favoured me with their opinions of the merits of the classes they were respectively called upon to judge. Mr. Weatherby, who was a member of the Jury for the Thorough-bred Stock, states that, "The classes of thorough-bred horses were so very indifferent that it was often hard to say which was the best amongst so many bad ones. In my opinion no prize at all ought to have been given; but my colleagues took a different view. All good judges were very much disappointed with our class, which was almost the worst in the Show. In the Arab Class the first prize was given to an *extraordinary* animal of the highest possible type of the race, a sight in himself worth all the trouble of the journey to Hamburg. The rest were of quite another order. The arrangements made for the accommodation of the animals were so good that, with my experience of English Shows, I was quite taken by surprise. It is very difficult to get together a good class of thorough-bred stallions in England, and abroad, the difficulty is still greater. If foreign Governments, which have a great many good stallions, could for the future be induced to send some to the Show-yard, a display equal, if not superior to our own, might lend its attraction to the Exhibition; for at no time has the thoroughbred horse been more in request on the Continent than at present."

Mr. Barthropp undertook the classes of Agricultural and Working Horses. "The show of horses," he says, "on the whole was most excellent. Although in the department with which I was concerned some of the classes were not well filled, many good animals were exhibited, and some that would have

held their own in many a Show-field in England. The first class, for Suffolk stallions, comprised 'Boxer,' the first-prize two-year old at Battersea; but he had not improved with his year, and was only highly commended. Baron von Nathusius exhibited the well-known 'Marquis,' a twice-winner at our 'Royal'—his age, however, was against him on this occasion; and Mr. Wilson took the 1st prize with a good useful three-year old, who found a foreign purchaser. Mr. Crisp sent six two and three year old stallions, and obtained a 2nd prize for one of them: as a proof of how the breed is appreciated on the Continent, but one of these colts, I believe, returned to England!

"The Suffolk mares were more admired than the stallions—and justly so, being a better sample of the breed. That spirited agriculturist Baron von Nathusius showed a clever three-year old, which, however, was not quite good enough to beat Mr. Crisp, who had it all his own way in most of the classes in which he exhibited.

"In the next class of stallions, 'for other English or Scotch horses,' in which several good animals were shown, 'The Brewer,' from Yorkshire, beat the Clydesdales. Two very useful mares from the Shaw Farm at Windsor were the winners in the class of mares of the above breeds. The classes of 'Percheron' stallions and mares were not well filled: the winners were active animals, but, in my opinion, more fit for road-work than for agricultural purposes.

"The class for half-bred stallions comprised twenty animals of almost every description; and the sooner the majority are castrated the better it will be for their respective districts. Three or four of the horses were good *in themselves;* but it must be a great lottery to breed from such decided crosses; and they appeared much more calculated to draw a diligence than a plough or harrow.

"The mares in the corresponding class were much better; and many of them, if put to a good thoroughbred horse, would produce good hunters.

"The Jutland horses were bad.

"The class of three and four-year old geldings contained several nice, clever colts; but they were thought too light for agricultural purposes, and the prizes were withheld. The same may be said of a class for one and two-year old entire colts, in which twenty-three were entered, many of them being by thoroughbred horses, and consequently more fit for hunting than for farm-work.

"The 1st and 2nd prizes for pairs of mares for agricultural purposes were taken by Mr. Crisp, who had no difficulty in dis-

tancing his three competitors. The arrangements and the accommodation of the show were excellent, but the classification wanted a little revision, as the exhibiting of yearling against two-year old colts, and three against four-year-olds, was hardly fair. Nevertheless the meeting as a whole was most satisfactory; and it is to be hoped that it will be the forerunner of many such gatherings, to the mutual advantage of both British and foreign breeders."

Mr. R. Smith has favoured me with the following remarks on the Cattle and Sheep Classes, of both of which Juries he was a member:—

"CATTLE.—There were some first-class specimens among th Bulls, such as 'First Fruits,' 'Gamester,' and 'Lord Lovell.' The were constantly surrounded by foreign inquirers, and must hav left their mark upon the foreign mind. Lord Kinnaird's bul 'Honey-dew,' famous in the North, showed great merit; he is massive, well-formed animal of fair quality. Amongst the shor horns bred on the Continent were two prize bulls and a heife descended from the Townley herd.

"The Ayrshires were by no means good; but there were som good specimens of the Galloway breed, which sold readily and a high prices. They were chiefly from Forfarshire. The mo prominent was Mr. D. Smith's (Leyshade) old bull; Mr. Stewart heifers, from Aberdeen, were also very choice.

"The French Charolaise breed was scarcely represented, an offered nothing remarkable.

"The Continental breeds were of much the same order, bu not so good a selection, as appeared at Battersea. Their enum ration would not avail much. Some of them had been bre from English bulls; and these were easily distinguished fro their leaner brethren. The most remarkable cross was from short-horn cow and a Zebu bull; another of a similar kind, w from a Zebu cow by an Ayrshire bull.

"The most striking feature of the foreign section of the Sho was presented by the working-oxen, which were shown in ve picturesque harness. They were of immense size, and oft represented a cross from English breeds, especially the Suss and Devon.

"The sale department of the Meeting was successful. Besic a clearance of nearly all the English South Down and Cotswo sheep, of some few Lincolns and Leicesters, of all the Gallow cattle, and of lots of pigs, Lord Walsingham sold his secon prize bull, 'Lord Lovell,' and Mr. Crisp his 'Gamester,' wh 'First Fruits' was purchased by a company in the neighbourho of Tonning, to be used by subscription. Several hundred Dow

r ewes were sold by salesmen and dealers. Four Scots, Mr. T. Lyell, fetched 500 guineas. One person in- 000*l.* in stock for sale at the Show.

pigs were numerous, and in many respects good. Messrs. id Sexton won many prizes, and sold their animals at l remunerating prices. A large sale was effected in this ent.

Exhibition may be fairly reckoned as a success; but a rations in the arrangements might be adopted with advan- Difficulties arose from the British-bred sheep being mixed the same breeds produced on the Continent; from the n and out of their wool, competing together; and from ibition of animals of different ages in one class, which undue advantage to the older ones, unless extra care and it were displayed by the Jury.

compliment was paid to the Judges by placing in their printed catalogue containing the entries and address of hibitor; but the English plan, of entering *the numbers* the Judge's book is, we think, preferable.

e plan of the prize-cards might be improved at any sub- Show. Instead of cards printed in *small type* placed *he loose* canvas which covered the sheds, at the highest the shedding where no one could read them, different l cards, legibly printed, and placed in a readable position, e substituted with advantage.

mpion prizes for the best male and female of different as given at the English International Meeting at Bat- vould also be a valuable addition to the prize-list.

EP.—The Sheep consisted of a great variety of form and ome kinds being well represented. In each class, animals ges were exhibited: the rams of one year old not being, ngland, distinguished from those of greater age. This nent proved very inconvenient, and gave the Judges con- e difficulty in comparing the merits of sheep of different

Merinos, which held the first place in the Catalogue, were two classes, according as their wool was fine, or of quality. The former comprised 165 rams and 103 pens es,—the latter, 324 rams and 323 pens of 3 ewes. This largest exhibition of Merinos ever held, and contained xcellent specimens; an increase of size and an increasing of wool were observable, effected probably either by a selection of the animals bred from, or by a distant con- with some other breed. In many specimens the expe- hand likewise detected a decided improvement both in

the quality and quantity of the flesh. It is a question of some importance whether the breeders of the Merino should confine themselves to the production of wool alone, or endeavour to obtain a more profitable carcase at the same time.

"*The South-Downs.*—The purchase of Lord Walsingham's best ram for 100 guineas by Baron von Magnus of Saxony, and the high price given by Herr Hedengren, on behalf of the Swedish Government, for the second-prize sheep, besides other sales, show how much these International Exhibitions remove prejudice. The following figures testify to the foreign estimation of the South-Down:—

	Guineas.
First prize yearling ram was sold for	100
Second "	50
Second " at Yarmouth	60
No. 18	40
Shearling	46½
Little sheep	35
Nine shearling ewes	80

Lord Walsingham's three unsold sheep had more than average merit: 80 guineas was refused for one. Good specimens of the Babraham flock were exhibited by Mr. Taylor, of Harptree Court, Somerset, who refused 30 guineas for his three commended shearling ewes. Mr. Gebhard, of London, exhibited, as specimens from the Goodwood flock, some well-made ewes of good character and quality.

"The Judges experienced considerable difficulty, particularly in one case, from the circumstance that some of the animals appeared in the wool while the rest were shorn. The effects of the heat and fatigue of travelling also told unfavourably on the looks of some, more especially those in their wool. Lord Walsingham lost a ram worth 70 guineas; Mr. Crisp another; and Mr. Taylor his best pure-bred Babraham yearling ram (brother to the prize ewes) before the prizes were awarded. A brother to the last-named ram was sold at a high figure to a Continental breeder. The Duke of Richmond's ewes, and others of Messrs. Crisp and Sexton, sold well. Of the South-Downs bred on the Continent, those exhibited by G. Zöppritz, Wurtemburg, Baron von Nathusius, and Baron von Magnus of Drehsa, may be mentioned as specimens of the most successful flocks. They are descended from the Babraham sheep, and were fair specimens; others had much deteriorated, some exhibitors having had no previous opportunity of knowing what an *English* South-Down ought to be. This International Meeting having shown the true type of animal, an increase in the foreign trade may be fairly anticipated."

"*Short-Woolled Breeds from Great Britain.*—These prizes were

fairly contested. Mr. Guerrier's (London) Oxford Down was of good form and quality; and the second-prize West-Country Down, bred by Mr. Humphrey, Oak Ash, Berks, a very fair specimen. Some good animals were also exhibited by Mr. Druce, of Eynsham; but, as they possessed heavy fleeces, my colleagues gave the preference to those animals which had more of the Down character.

"There were only three entries for short-woolled ewes, not being South-Downs; but these were sufficient representatives of their class.

"The Leicesters from England and Scotland were fair specimens. Mr. Groves (Kirk Hammerton Lodge, Yorkshire) obtained the first prize and an honourable mention with some good animals. Lord Kinnaird's sheep were of a useful kind; his Leicester ewes distanced all competitors: they were descendants of the old flock from Burley-on-the-Hill, and had kept their quality and form well up to the good age of five and six shear ewes.

"The Leicesters bred on the Continent were moderate sheep, by no means approaching the English Leicester, but the prizes were distributed for encouragement.

"*Lincolns Bred in England.*—All the prizes in this class would have gone to the flock of Mr. Marshall (Branston, Lincoln) but for the foreign Judges' prejudice against heavy fleeces; however, as the English judge, I insisted upon Mr. Marshall's shearling receiving the first prize; and the second was awarded to Mr. J. Clarke, of Long Sutton. Mr. Marshall's two-shear was placed third, and his ram-hogs, with fleeces of lustre-wool of at least 20 lbs. each, were highly commended.

"There were some splendid specimens among the sheep shown from the Branston flock. Mr. Clarke's sheep were also good, especially his prize ram, which had a fair form, with good quality of wool and mutton. The first and second prize shearling ewes were also good animals.

"*Cotswolds Bred in England.*—This breed was well represented, some being sent to compete for the prizes, and some for sale. Mr. Handy's first prize was a splendid old sheep: it is a question whether it is advisable to send so fat an animal such a distance. Mr. Garne's sheep were worthy of notice, and Mr. Sexton's three shearlings were much admired. The ewes were some of them fair specimens; Mr. H. Gebhard's were of a useful kind. Many Cotswolds were sold to foreign buyers.

"*Long-woolled Sheep of a Continental Race.*—These were chiefly from the marsh-lands of Holstein, with a few from Hanover. The Holstein race is a large breed, standing very high, remarkable for its prolific character, as the following in-

stance, quoted from the Catalogue as the entry of M. Dammfleth, Wilstermarsch, Holstein, will testify :—

1 ewe	.. ..	5 lambs	.. ..	3 years old.
1 „	.. ..	4 „	.. ..	„
5 ewes	.. ..	3 „	each	„

A produce of twenty-four lambs from seven ewes must be the notice of the Acclimatization Society! M. Dohrn pu two Cotswolds for crossing this race, to introduce a mor producing element.

"Nearly every form, colour, and class of wool that c thought of was represented in the other classes for foreign some being with and some without horns. Many of the might be improved by an infusion of English blood; bu care would then be required to maintain the family charact of the Continental breed. There were some interesting bred classes showing a profitable return. In one insta Cotswold ram and a Merino ewe had produced a pro animal, with fair wool and feeding qualities. Bar Nathusius sent specimens of the crosses termed Co Merino, South-Down Merino, and Leicester-Merino, s them capital animals. There was also a good-looking termed Dishley-Merino, another Lincoln-Velmoe. These will aid in extending the international element and the for English rams.

"The average live-weight of the three shearling e shown in the different classes, and weighed for record suggestion, was as follows :—

	Hamburg
Lord Walsingham's prize Southdowns	167
Mr. Zöppritz's prize Southdowns, bred on the Continent	155
Mr. Humphrey's West Country Downs	169
Mr. Smith's (Hull) Leicesters	164
Mr. Marshall's Lincolns	260
Mr. Gibson's Cotswolds	192
Mr. Dohrn's Holstein Ewes (with 5 lambs)	200
„ 5 lambs	84

"The above are stated in New Hamburg weight, 100 which are equal to 107 lbs. English. This testing of the affords a useful check and verification when a doubt whether sheep have been fairly shorn, and places *substanc* proper position.

"Mr. Marshall exhibited, in the Section of Agric Products, five fleeces of wool, which were minutely ins by the authorities, and thus noticed :—

"'Three Lincoln hog fleeces, very fine, each 17 lbs. burg). Two fleeces from two-years old sheep, heavy anc each 19 lbs. The length of the staple upon the ram-hogs

classes was 18 inches, in broad locks of a bright, rich, ·lustre caste.' "

;HINERY AND IMPLEMENT DEPARTMENT.—In this depart- :he only money prizes were given to the Steam-Plough titors; to all other successful exhibitors the awards were in Medals in Gold, Silver, and Bronze.

. Steam-Plough competition took place under the most sfactory conditions; indeed it would have been well-nigh sible to have selected a piece of ground less suited to t the great advantages which it possesses, as regards both ny and excellence of work. The fault of selection, how- vas not that of the Executive Committee, as, although every on was made by them, it was found impossible, owing to ture and the occupation of the surface round the city, to any other land, within a convenient distance, sufficiently for the purposes of the trial. The costs the Committee alled upon to incur, for the temporary occupation and use f this unsuitable land, were at the rate of about 25*l.* per acre. were four competitors for the prizes—Messrs. Fowler and . F. Howard, who exhibited their well-known respective ds of Steam Cultivation; and Messrs. Ransome and Sims, ichardson and Darley, who used modifications of Fowler's ement. The 1st prize of 700 thalers (105*l.*) was awarded '. Fowler, and the 2nd of 300 thalers (45*l.*) to Messrs. rds for their different methods of applying steam-power ughs and the cultivation of the soil; and a "special" Medal was given to each of the other competitors for their ications of Fowler's apparatus. The trials excited the st interest; and, notwithstanding the want of ready access ground, the spirited outlay of the Executive Committee ewarded by a clear profit of 91*l.* from the proceeds of sion to the trial ground, although the expenses incurred for nd for these and the Reaping-machines' trials had been marks = 368*l.* 15*s.* 6*d.*.

: following awards of Medals were also made:—

MEDAL.—Messrs. Barrett, Exall, and Andrewes; Garrett and Son; F. Howard; Ransome and Sims; Clayton and Shuttleworth; Hornsby ıs.

;E SILVER MEDAL.—Messrs. B. Samuelson and Co.; Aveling and Porter; rton and Co.; E. R. and F. Turner; Woods and Cocksedge; A. C. Bam- . Burrell; T. W. Ashby and Co.; Burgess and Key; W. N. Nicholson; Bentail; Priest and Woolnough; Coleman and Sons; Ruston, Procter, .; Marshall, Sons and Co.

L SILVER MEDAL.—Messrs. W. C. Cambridge; W. McCleman; R. and ker; W. Wilkinson; James Powis and Co.; Spear and Jackson;

Thompson and Avery; Thomas Green and Son; R. Boby; Walter A. Woods; Brigham and Bickerton; Kemp, Murray, and Nicholson; James Smith and Son.

LARGE BRONZE MEDAL.—Messrs. George Smith and Co.; Stevens' Bread Machinery Company; F. Helmsing and Co.; John Goucher; T. B. and R. Hunt; Thomas Bradford; G. W. Belding and Co.; G. P. Dodge; H. Puckering and Co; Doulton and Co.; Webb and Son; S. S. Wilkinson; G. C. Scruton; W. Smith; J. W. Barrow and Co.; J. J. Porter and Co.; G. Bower.

Considering the small amount of publicity given to the details of the proposed Show in this country, and considering also the inopportune time (for us) at which it was to be held, interfering so directly as it did with our own great annual Meeting at Worcester, the names and contributions given show clearly the interest taken by our breeders and machinists in such meetings, and their readiness to take part in them, even under the adverse circumstances as to the date at which the Hamburg Show was held.

The Meeting at Hamburg commenced on Tuesday, the 14th July, and our own Show-yard, at Worcester, was opened to the public on Wednesday, the 15th; thus retaining at home, without doubt, not only many of our farmers and our engineers, but the cattle and the implements which would otherwise have added both to the number of the visitors and of the contributions to the great Meeting at Hamburg. This clashing between the great Meetings was unfortunate no doubt to both countries; but, under the circumstances, it appears to have been unavoidable. It would have been unreasonable for us to expect that our interests and our convenience alone would be consulted in such an undertaking. To its success the German element was of more consequence and likely to contribute far more than the British, and the period of the Meeting was determined accordingly.

In Northern and Eastern Germany horses and sheep form the most important features in stock-farming;—in many of the countries on the Continent the former, indeed, come directly within the superintendence of the Government. The Show would have been deprived of its main features of interest and of benefit had these two classes of stock not been fully represented; and this could not have been achieved had the period of the Meeting been fixed at either an earlier or later date. It appears that the Stud-Horses do not come in from the districts in which they are appointed to serve until the last week in June, after which a clear week was required to get them up into condition for the Show. On the other hand, it was most important that the Sheep should be exhibited in the wool, which the great flockmasters were unwilling, for obvious reasons, should remain, at that season, unshorn one day longer than was absolutely required by the circumstances

the Show. Thus a fair and reasonable explanation is afforded a circumstance which, at the time, was freely commented on by our countrymen, and appeared to some as a mistake or oversight.

The Show-ground was immediately outside the city gates, on arge open space known as the "Heiligengeistfeld," and adjoin- the city of Altona. It was thus readily accessible from all parts both cities. The accompanying ground-plan (p. 230), with its planatory details, gives the mode of distribution of the space :upied by it, which amounted to 1,598,430 square feet (Hamrg), or 32·4 acres; the whole area being surrounded by a -foot deal fence.

This space was occupied as follows:—

	Square feet.
1. The entire horses in 11 sheds, covering*	16,200
2. Mares, mares with foals, other horses in 9 sheds ..	27,200
3. Bulls and cows in 25 sheds	43,000
4. Sheep in 19½ sheds	30,700
5. Pigs in 6½ sheds	10,920
6. Poultry in 3 sheds	2,750
7. Agricultural products in 6 sheds	27,000
8. Machinery and implements in 12 sheds	48,000
9. Machines, &c., in motion	167,082
10. Flower-show, 2 sheds	9,720
11. Offices of Executive Committee	4,830
12. Restaurateurs and retiring rooms	19,250
13. Refreshment tents, 4	8,000
14. Music pavilion	625
15. Photographic department	1,500
16. Water-closets, 6	1,500
17. Ring for horses	26,376
18. Sheds for forage, litter, &c.	5,000
19. ,, corn for threshing	5,125
20. ,, coals	4,038
21. Store-sheds for cattle classes	3,850
22. Sheds for machinery	15,500
25. Stalls for sick cattle	300
26. Wood-stores	2,774
27. Engineer's offices	900
Total space covered	482,140
Leaving free for the public	1,116,290
Total area enclosed	1,598,430

The prices for admission were as follows:—The first day, ly 14th (10 marks), 11*s.* 10*d.*; the 15th, 16th, 17th, and 18th thaler), 3*s.*; the 19th (Sunday) (½ mark), 7*d.*; the 20th (1 mark),

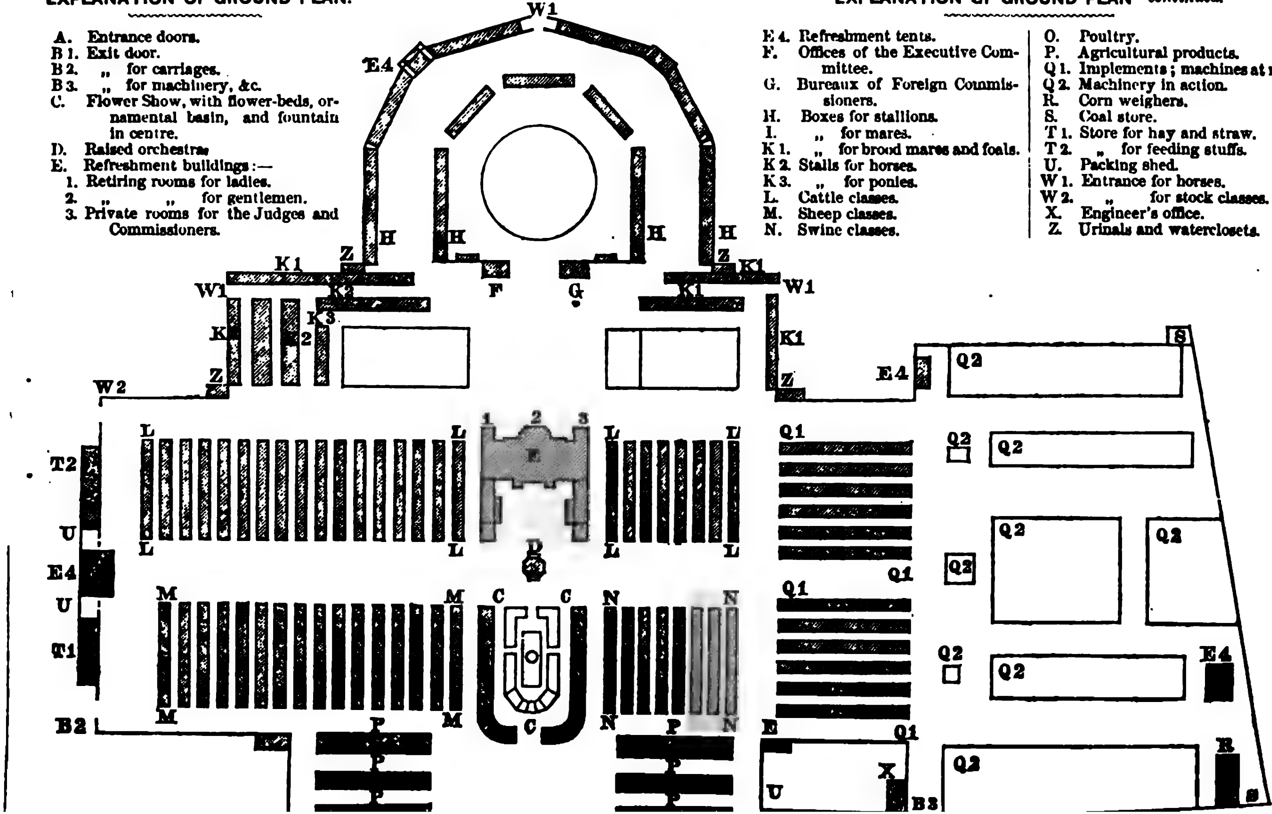
* The figures given are in the Hamburg measurement, the difference between t and our own being but small; 100 square feet Hamburg are equal to 88·36 glish measurement.

EXPLANATION OF GROUND PLAN.

A. Entrance doors.
B 1. Exit door.
B 2. „ for carriages.
B 3. „ for machinery, &c.
C. Flower Show, with flower-beds, ornamental basin, and fountain in centre.
D. Raised orchestra.
E. Refreshment buildings:—
1. Retiring rooms for ladies.
2. „ „ for gentlemen.
3. Private rooms for the Judges and Commissioners.

EXPLANATION OF GROUND PLAN—*continued.*

E 4. Refreshment tents.
F. Offices of the Executive Committee.
G. Bureaux of Foreign Commissioners.
H. Boxes for stallions.
I. „ for mares.
K 1. „ for brood mares and foals.
K 2. Stalls for horses.
K 3. „ for ponies.
L. Cattle classes.
M. Sheep classes.
N. Swine classes.
O. Poultry.
P. Agricultural products.
Q 1. Implements; machines at rest.
Q 2. Machinery in action.
R. Corn weighers.
S. Coal store.
T 1. Store for hay and straw.
T 2. „ for feeding stuffs.
U. Packing shed.
W 1. Entrance for horses.
W 2. „ for stock classes.
X. Engineer's office.
Z. Urinals and waterclosets.



1*s.* 2*d.*; 21st (1 thaler), 3*s.*; 22nd and 23rd (½ mark), 3½*d.* In addition to those who paid the above prices for admission at the gates, a large number of tickets (5168) were sold giving admission during the continuance of the Meeting. For these the charge was 15 marks each, or 18*s.*

The number of persons admitted each day by tickets and by payment at the gates was as follows:—

	By Admission Ticket.	By Payment.	Total.
July 14	5,000	670	5,670
" 15	5,000	14,201	19,201
" 16	5,000	19,086	24,086
" 17	5,000	19,571	24,571
" 18	5,000	12,658	17,658
" 19	2,600	40,118	42,718
" 20	3,000	44,507	47,507
" 21	4,000	2,511	6,511
" 22	1,000	2,990	3,990
" 23	600	1,404	2,004
	* 36,200	157,716	193,916

The Finance department, the most satisfactory test of the practical success of such undertakings, alone remains to be touched upon. This presents a most satisfactory and encouraging appearance; for although the total expenditure was no less than 296,685 marks, or 17,706*l.* sterling, the nett proceeds amounted to 376,615 marks, or = 22,457*l.* sterling, thus leaving a clear surplus of receipts over expenditure of 79,480 marks, or 4751*l.* sterling.

The several details of the *Expenditure* may be considered under the following heads:—

1. Prizes in Money, Cups, and Medals.
2. Costs of construction, decoration, &c.
3. Working expenses.
4. Expenses of foreign Jurors and guests.
5. Expenses of administration.
6. Sundry expenses, including music, printing, advertisements, &c. &c.
7. Surplus of receipts over expenditure.

* The numbers given of admissions by these tickets must be considered rather as an estimate than as being strictly correct, as the registration was very imperfect. At the same time it should be observed that the numbers given of admissions by payment are in all probability considerably below the correct amount, as great irregularities, on the part of the money takers in the admission department, were discovered at an early period of the meeting.

The several items of those expenses may be perhaps best giv[illegible] in a tabular form, as follows:—

	Marks current.		£.
1. *Prizes*:—			
A. In money	*48,262½	=	*2881·34[illegible]
B. In cups	5,350	=	319·40[illegible]
C. In medals	11,102½	=	662·83[illegible]
			3863·58[illegible]
2. *Construction, &c.*:—			
A. Buildings	95,168¾	=	5681·716
B. Groundworks	4,966¼	=	296·492
C. Decorations	7,755¼	=	463·
D. Flower show	2,680¾	=	160·044
E. Water supply and fittings	10,296	=	614·686
F. Lighting	418	=	24·955
			7240·893
3. *Working Expenses*:—			
A. Forage	13,963½	=	833·641
B. Coals	1,234¾	=	73·716
C. Transport expenses	872½	=	52·089
D. Land for steam-plough trials	6,177	=	368·776
E. Fire insurance	640¾	=	38·253
F. Police and fire-guard	3,757½	=	224·328
G. Small expenses	3,198	=	190·925
			1781·728
4. *Expenses of sundry Jurors and guests*	10,921¾	=	662·044
5. *Expenses of Administration*:—			
A. Salaries, presents, &c.	28,939¼	=	1727·716
B. Hire of offices	1,260	=	75·223
C. Stationery, &c.	866¾	=	51·746
			1854·685
6. *Sundry Expenses*:—			
A. Music	1,800	=	107·462
B. Printing	23,513	=	1403·761
C. Advertisements	9,710½	=	579·781
D. Postage and telegrams	2,373	=	141·671
E. Bank commission and loss on Change ..	1,455¼	=	86·880
			2319·505
7. *Surplus*:—			
A. Claims on sundry exhibitors for disbursements	1,475½	=	88·089
B. Cash	78,005½	=	4657·044
			4745·133

* In these tables the pound sterling is calculated at 16·75 marks, the rate of exchange at the time.

ɪe *Receipts* may be tabulated under the following heads:—

1. For admissions to Show.

2. Entry-fees for Stock, &c.

3. Rent.

4. From sundry sources.

he details are as follows:—

rsonal Admissions:—

	Marks.		£.
Tickets for the meeting	77,520	=	4,628·059
Cash taken at the doors	242,407	=	14,472·059
Taken at steam plough and reaper trials ..	7,708½	=	460·208
For catalogues	16,343	=	975·716
			20,536·042

ʉtry Fees:—

	Thalers.		£.
For machinery, &c.	4,047	=	607·05
Stock	4,157½	=	623·625
Products	1,150	=	172·5
			1403·175

nt:—

	Marks current.		
From restaurateurs	4,000	=	238·805
4 refreshment tents	1,200	=	71·641
Photographic atelier	125	=	7·462
			317·908

ndry Sources:—

Commission on auction sales	1,362½	=	81·343
Sale of manure	515½	=	30·776
„ surplus coals	1,344¾	=	80·283
Interest on balances	253½	=	15·134
			207·536

ɪch are the details of the International Agricultural Meeting amburg, an undertaking as creditable to those who organised conducted it as it was satisfactory to those who attended

	£.
* On the 14th	400·000
„ 15th	2119·552
„ 16th	2848·656
„ 17th	2921·044
„ 18th	1889·253
„ 19th	1197·552
„ 20th	2657·134
„ 21st	374·776
„ 22nd	44·626
„ 23rd	19·462
	14,472·055

it, whether as exhibitors or merely visitors. The benefit, too, to the country in whose interests it was mainly undertaken, cannot well be overrated. The numbers who came from distant parts to see it, in spite of the unfavourable, nay inclement, weather during the entire period of the Show, testify to the interest it excited, and to the sound judgment and discrimination of the Executive Committee, who had recognised and supplied a requirement of German agriculture.

Under even the unfavourable circumstances of a first attempt, of bad weather, and of the unforeseen and lamentable loss which the Committee sustained on the very eve of the Meeting by the death of its President,* its success was beyond all expectation. Let us hope, in the interest of agriculture generally, that a festival which has been so successfully inaugurated may be perpetuated—that we may at no very distant day be again invited to take part in another International gathering on the same ground, when I feel certain that the good results of the last will secure even a greater proportion of exhibitors from Great Britain than were then present, creditable though that proportion was.

IOHN WILSON.

IX.—PROFESSOR VOELCKER'S *Annual Report. 1. Adulteration of Oilcake; 2. Of Artificial Manures; 3. Analysis of Egyptian Guano; 4. Of Nile-water; 5. Causes of Barrenness in Soils; 6. Subjects recently under Investigation.*

IN my last annual Report I directed attention to the enormous extent to which oilcakes, professedly sold as genuine, were mixed with cheap refuse feeding-materials, or with more or less unwholesome foreign impurities, imported with the seed from which such cakes were made.

1. At the request of the Council I delivered a lecture before the Society on the subject of cake adulteration, which appears to have attracted considerable attention in the agricultural and commercial community, and I have now the satisfaction to report that a great improvement has taken place in the manufacture of oilcakes. Amongst the samples sent for examination during the past season, comparatively speaking, few were found to be grossly adulterated or absolutely injurious to cattle, and a large proportion were what they professed to be, pure genuine linseed-cakes

* On the death of Baron Ernst Merck the Presidency of the Executive Committee devolved upon Mr. Aug. Jos. Schön, under whose able management, aided by the personal exertions of his colleagues, the Meeting was conducted to such a successful termination. To this gentleman I am indebted for the statistical details given in this Report.

of superior quality. Still, however, inferior and more or less impure cakes find their way into the hands of the agriculturist; and continued vigilance on the part of the purchaser is still desirable, in order to put the trade in oilcakes into a healthy condition. A step in the right direction has lately been taken by the seed-crushers themselves, who, to check seed-importers in the practice of mixing linseed with worthless and often injurious weed-seeds before it reaches the shores of England, have organized a plan which will secure the importation of linseed, containing not more than 5 or 6 per cent. of foreign impurities. Little or no difficulty may therefore be expected in procuring pure linseed-cakes, provided a fair remunerative price is paid for them.

The best cakes examined by me this season were of English make, stamped "Pure." Almost equal to them I found several samples of Marseilles cake. The latter, however, though pure and superior to the generality of English cake, are, as a rule, not quite so good as the best English or American, inasmuch as they are too hard pressed, and, consequently, rather deficient in oil. For store stock, on the other hand, they will be found an economical food on account of their moderate price. In buying this cake, care should be taken to select good samples, inasmuch as it is frequently mixed with nut-cake.

Decorticated cotton-cake, which is only made in America, is now seldom seen in the market, and its place is now taken almost entirely by whole-seed cake of English make. In former years, cases of so-called poisoning with cotton-cake were frequently brought under my notice; in the past season only three or four instances of the injurious effects from its use were referred to me: from this it may be inferred that English cotton-cake is now generally sold in a better condition than formerly. This, indeed, is the case. Having failed to detect an essentially poisonous matter in any of the cotton-cakes, which, nevertheless, unquestionably had an injurious, and, in many cases, fatal effect upon the animals to which they were given, I looked closely into this matter, and learned that the injury to cattle was produced by the hard, indigestible, and badly comminated husk. My suggestion to remove a portion of the coarser husk by screening, and to reduce the remainder into a tolerably fine powder, has been adopted by several makers, who have thus removed the chief defects that characterize all cakes in which the husk may be seen in large fragments. Inferior cake has always a brownish colour, instead of a more greenish-yellow appearance.

2. The lecture on Manure Experiments on Grass-land delivered by me last May has led to an extended correspondence, and elicited many inquiries from members of the Society, affording an

indication that the improvement of grass-land is now receiving a greater share of attention than formerly.

It is with satisfaction that I have to report that the adulteration of artificial manures is decreasing from year to year. Few samples of Peruvian guano are now found to be adulterated, and superphosphate of lime and similar fertilizers are generally sold in a better condition and of higher intrinsic value than in former years.

3. A new description of guano was recently sent me for examination from Egypt.

Two samples were found on analysis to contain in 100 parts:

	No. 1.	No. 2.
Moisture	17·19	15·06
*Organic matter and salts of ammonia	39·50	39·30
Phosphates of lime and magnesia (bone-earth)	18·28	19·89
Sulphate of lime	2·76	3·15
Alkaline salts (chiefly chloride of sodium)	20·93	20·39
Insoluble siliceous matter	1·34	2·21
	100·00	100·00
*Containing nitrogen	11·81	10·93
Equal to ammonia	13·97	13·27

Though not equal to Peruvian guano, these two samples are very valuable, and richer in nitrogenized organic matters than most other varieties of guano and artificial manures. Whether this guano is found in large quantities or not, and is likely to be imported into England, I have not as yet been able to ascertain.

4. The Government of Egypt for some time past has actively encouraged agricultural improvements. In the course of an investigation into the agricultural resources of that country, specimens of Nile-water were lately sent to me, that I might endeavour to determine the causes of the remarkable fertilizing effects which it produces, and to ascertain at what period of the rise of the Nile the water is most valuable as a fertilizer.

The first specimen was taken at the beginning of the rise, and on examination was found to contain, in an imperial gallon,—

	Grains.
Suspended matter	23·83
Soluble matter	17·87

The suspended matter, it will be seen, amounts to more than the matter held in solution. It was found to consist of:

	Grains.
Mineral substances (fine clay and sand)	20·89
*Organic matter	2·94
	23·83
*Containing nitrogen	·11
Equal to ammonia	·13

r filtered water left on evaporation, when dried at 300°
17·87 grains of dry residue, which, on analysis,

c matter	2·12
of iron and alumina, with traces of phosphoric acid	·07
s of lime	1·85
ate of lime	4·36
ate of magnesia	2·81
ate of potash	·66
ate of soda	3·26
le of sodium	2·30
te of potash	·93
of potash	·18

portion of soluble matters in this specimen of Nile-ill be seen, is very trifling. On the other hand, it good deal of carbonate of soda and magnesia. When d deprived thereby of its sediment, which appears y instrumental in renewing the fertility of the land, is wholesome and agreeable to the taste.

nd specimen of Nile-water was taken at the height of nd distinguished from the first sample by a bright, d-red colour.

ing for a considerable length of time it lost its colour, ed per imperial gallon, 87·51 grains of solid matter, isted of—

l substances (extremely fine clay and sand, con-ing a great deal of oxide of iron)	81·66
c matters	5·85
	87·51
ontaining nitrogen	·26
Equal to ammonia	·31

ered and clear water on evaporation and drying at , furnished 11·88 grains of solid residue per imperial is residue, on analysis, yielded—

c matter	1·54
of iron and alumina, with traces of phosphoric acid	1·04
ate of lime	1·41
of lime	3·87
te of lime	1·32
le of sodium	·79
ate of soda	·48
of potash	·84
ate of magnesia	1·15

colour of this Nile-water I find not to be due to tter, but to extremely finely-divided oxide of iron. roxide remains in suspension for weeks together, and s a bright red colour to the water.

There is a good deal of difference in the composition of Nile-water taken at the beginning and at the height of the flood. In the latter stage the suspended matter is nearly four times as large as at the beginning of the rise. On the other hand, the amount of soluble matter is a good deal less. The decrease of soluble organic matter in the second specimen is very remarkable, and as there is much more nitrate of potash in the water at the height of the flood, it would appear that the nitrogenous organic matter is rapidly converted into nitric acid, which, uniting with potash, forms nitrate of potash, a constituent which has been discovered before in Nile-water, but, as far as I know, not quantitively determined.

Although the soluble saline constituents which are present in this and other waters used for irrigation contribute to their fertilizing properties, in the case of Nile-water it is chiefly the suspended matter which produces the well-known and astonishing effects upon vegetation. In this suspended matter we have both mineral and organic matters in a highly divided and most effective condition. If it be remembered that the second specimen of water contained a quantity of suspended organic matter, which on decomposition furnishes 3-10ths per cent. of ammonia in round numbers, and that, consequently, every 1000 gallons, in addition to an enormous quantity of mineral food for plants, contain an amount of organic matter in suspension which, when deposited on the land, will gradually generate no less than 300 lbs of ammonia, no surprise will be felt at the results practically obtained in the irrigated districts of Egypt.

My object in relating some of the details which were brought to light in the course of my examination of Nile-water, is to direct the attention of the English farmers to the benefits which are in most cases likely to result from a good system of irrigation. It is well known that some waters are better adapted for irrigating purposes than others; but our information on the particular circumstances which determine their relative value is very limited. This subject is well worth a careful and extended chemical investigation.

5. For some time past my attention has been directed to an examination into the causes of that barrenness which characterizes some soils, and the great fertility which distinguishes others. Several soils have lately been examined by me, which were almost completely barren, and yet neither in their texture nor any other physical characteristic presented any indication that marked them as such.

Some important results have been obtained already, and others may perhaps follow on further pursuing this inquiry.

In addition to the usual analytical work for members of the ty, and the investigation to which reference has been made e preceding observations, the following experiments were ed on by me during the past season:—

On Milk and Dairy-management:—

n this subject, and on the composition of annatto, papers, odying the results of my investigations, appeared in the last ber of the Journal.

On the Solubility of Phosphatic Materials in Water and ne Liquids:—

he results of this investigation are ready for publication, will form the subject of a paper in a future number of the rnal.

. On the means of preserving and rendering more efficient Fertilizing Constituents of Peruvian Guano:—

paper on the subject will be found in the present number of Journal.

. Experiments with Nitrate of Soda on the Wheat-crop:—

he results of these experiments fully confirm the favourable iions which I expressed in former communications of nitrate oda, when judiciously used as a top-dressing for wheat. s, in one experiment, the produce of the land not top-dressed 38½ bushels of wheat, and that of land top-dressed, at the of 2 cwt. of nitrate of soda and 4 cwt. of salt per acre, was bushels.

he application of nitrate of soda, in conformity with the lts obtained in previous years, increased the yield of both in and straw.

. Experiments with Salt on Mangold; Swedes and Turnips; eat:—

he crop of Swedes and turnips were such failures that no sfactory conclusion can be drawn from the experiments. In Mangold crop, when grown on heavy land, no effect was ervable, but on light sandy soil a beneficial result followed m the use of salt. Applied to wheat, it decidedly checked development of the leaf and stem; but whilst less straw was ained from land so top-dressed, the yield of grain was neither ninished nor increased.

AUGUSTUS VOELCKER.

2, *Hanover Square, London,*
December, 1863.

Analyses

Analyses made for Members of the Royal Agricultural Society, January to December, 1868.

Guano	40
Superphosphates and similar artificial manures	64
Nitrate of soda and salts of ammonia	25
Refuse manures	29
Bone-dust	24
Limestones and marls	37
Soils	28
Waters	10
Oilcakes	91
Feeding-meals and vegetable productions	10
Examinations for poison	5
	363

X.—*Salt Experiments and Mangolds.* By Dr. AUGUSTU VOELCKER.

COMMON salt has been employed in all ages and in all coun for the purpose of promoting the growth of cereal and minous crops, grass, and roots—in short, every descripti agricultural produce.

It has, moreover, been specially recommended, by experie and intelligent farmers, as a most useful accessory m for the mangold crop. On the strength of their testimo must be admitted that salt has proved of much utility to man in many instances, yet we must be prepared to meet with c in which it is certainly useless, and may even be hurtful.

When facts appear to contradict each other, it is of no av deny the validity of practical evidence, or to accept only facts as true which agree best with our individual experi we must rather try to gather information from our failur well as from successful experiments. In common agricul life an experiment with this or that manure by which a siderable increase in the crop is obtained is characterised success; but if unattended by such increase, as a failure: wh in reality, such a success is often rather a failure. For, in a philosophical sense, experiments are really successful only they teach something that can be clearly recognised as an ab lesson either for warning or for imitation. Upon the accur tion of a mass of such well-ascertained facts, our ultimate ol namely the establishment of general principles applicable to culture, must depend.

In this more philosophical sense, it must be confessed th do not possess many successful agricultural experiments with It has, perhaps, been tried more extensively and under a gr variety of circumstances than any other fertilizer, and y

eneral no better answer can be given to the inquiry "What ave we learned from these trials?" than simply this: "in some ases salt did good—and in others, not." Such a reply clearly an be no guide for successful applications in future.

Impressed with the reputation which salt has gained as a nanure for mangolds, I tried some experiments in 1862 in the 1ope of ascertaining the quantities which might be used to the best advantage. In recording the results of these and similar experiments, I consider it very important that the physical and chemical properties of the soil should be described as carefully as possible. Observations on a large scale have convinced me that the nature of the soil has a great deal to do with the success or failure in all cases where salt is tried as a manure.

The field in which the experiments were tried was in excellent condition, both as regards manuring and mechanical working. It bore clover in 1860, and a good crop of wheat in 1861. It received a good dressing of dung in the autumn of 1861, and was in capital order when the mangolds were sown in 1862. The soil was a calcareous clay, containing no sand, and a sufficient amount of clay to render it decidedly heavy and difficult to work in wet weather. The subsoil on which it rests is stiff clay. A portion of the soil, taken from a large sample removed from different parts of the field, was submitted to analysis, and the following results obtained:—

Composition of Soil from Experimental Mangold-field of the Royal Agricultural College Farm, Cirencester.

Moisture (when analysed)	4·710
Organic matter and water of combination	10·022
Oxides of iron and alumina	15·602
Carbonate of lime	16·448
Sulphate of lime	·375
Phosphoric acid	·072
Carbonate of magnesia	·798
Potash	·832
Soda	·098
Insoluble siliceous matter (clay)	50·787
	99·744

It will be seen that clay is the preponderating constituent of this soil, which contains also a considerable proportion of carbonate of lime.

Nine plots of 1-20th of an acre were selected for the experiments from the most even part of the mangold-field. The mangolds grew vigorously where the salt was sown by hand along both sides of the drills on the 29th of July. Each plot consisted of four drills. One plot received no salt; the eight others were dressed at the rate of from 1 to 8 cwts. of common salt per acre. The roots were counted and carefully weighed after cleaning and dressing.

The following Table shows the results that were obtained:—

EXPERIMENTS WITH SALT UPON MANGOLDS (ORANGE GLOBE).

Plots of $\frac{1}{20}$ Acre.	Salt applied per Acre.	Number of Roots per Plot.	Produce per Plot.			Produce per Acre.		
	cwts.		Cwts.	qrs.	lbs.	Tons.	cwts.	lbs.
No. 1	1	482	16	3	8	16	13	48
,, 2	2	516	16	0	23	16	4	12
,, 3	3	498	14	2	21	14	13	4
,, 4	4	517	14	3	17	14	15	4
,, 5	Nothing	497	15	0	12	15	2	16
,, 6	5	546	18	0	27	18	4	92
,, 7	6	480	16	2	13	16	12	36
,, 8	7	502	14	1	19	14	8	44
,, 9	8	515	14	3	25	14	16	52

These experiments, it must be confessed, are not calculated demonstrate the utility of salt as a manure for mangolds.

On four plots the produce was actually slightly lower than (the plot not dressed with salt, and, omitting plot No. 6, tl increase in the crop on three plots was but inconsiderable.

The result obtained on plot No. 6 is evidently exceptional, t much larger number of roots grown on this plot having, no doul affected the product. It is likewise possible that more farmyaı manure may have been accidentally dropped here than on otl portions of the experimental field. In all probability, the d ferences in the amount of produce of all the nine plots are ratl due to the difficulty of distributing farmyard-manure uniform and to the natural variations in the productive powers of the d ferent parts of the field, than to the use of salt.

Whatever may be the cause of the variations in the produ salt evidently did not produce a decidedly beneficial effect up the mangold-crop.

All the roots of each plot were carefully weighed, and it incumbent on the experimenter faithfully to record the resul though they may present discrepancies for which an explanati cannot be given.

In conclusion, it is well to bear in mind that the soil of t experimental field was a stiffish calcareous clay. On land that character, common salt, if I am not mistaken, seldom pı duces any good effect; whilst on light sandy soils, if my exį rience teaches me true, it is generally applied with great succe It would, therefore, be wrong to say in a general way that s is of no use to mangolds; all that can be said with propriety that in the preceding experiments it did not produce a decided beneficial effect upon that crop.

12, *Hanover Square, London (W.), February,* 1864.

XI.—*Statistics of Live Stock for Consumption in the Metropolis.* By ROBERT HERBERT.

DURING the last six months of 1863, the metropolitan cattle-market was somewhat heavily supplied with beasts, which with few exceptions came to hand in excellent condition, and met a ready sale at steady prices. The past may be considered as one of the most successful, if not the most profitable, seasons on record for the production of fat stock, as regards both England and Scotland, but in the beasts dérived from Ireland no improvement has been apparent, and they have therefore changed hands heavily at moderate rates, notwithstanding that only 11,280 beasts were received from that quarter, against 14,820 in the corresponding period in 1862, and 14,340 in 1861. The supply from Lincolnshire, Leicestershire, and Northamptonshire comprised 66,510 head; being a slight falling off compared with the previous year. From various other counties, exclusive of the eastern districts, 21,250 head were reported; whilst from Scotland the arrivals were on a fair average scale.

Although the crop of grass was deficient in most parts of the United Kingdom, and the quantity of hay secured was scarcely an average, most breeds of sheep made their appearance in greatly improved condition. The Downs, half-breds, Leicesters, Lincolns, Kents, and Hampshire Downs especially were in prime order; nevertheless, the mutton trade was in a healthy state, and prices were remarkably steady. Up to quite the close of the season lambs came forward in rather large numbers, and the sale for them was rather active at high rates. Calves and pigs were in but moderate request, and the supplies in the market were far from extensive. The annexed Table shows the total numbers of each kind of stock exhibited in the last six months the year 1853, as well as in those of the last four years:—

Total Supplies of Stock Exhibited.

Last half of year.	Beasts.	Cows.	Sheep and Lambs.	Calves.	Pigs.
1853	149,008	3191	860,800	17,058	15,284
1860	145,420	3015	762,740	15,766	15,470
1861	149,750	3187	774,260	12,441	20,116
1862	159,450	3148	759,671	12,579	18,220
1863	168,232	3127	761,070	14,822	17,550

The excess in the total supply of beasts over that of the last six months in 1862—8782 head—arose from large arrivals from the Continent, which rather exceeded 61,000 head against 37,843 head in the preceding year. It follows, therefore, that the

additional supplies have been made up of foreign importa
The district bullock arrivals are detailed in the following
ment:—

District Bullock Arrivals.

Last half of year.	Northern Districts.	Eastern Districts.	Other parts of England.	Scotland.	Ire
1853	54,650	8650	14,500	4728	7
1860	66,140	9500	20,500	1151	7
1861	71,450	2500	9,700	4586	14
1862	74,570	5050	19,620	3307	14
1863	66,510	3850	21,250	3213	11

The supplies of foreign stock showed greatly improved q
Many of the beasts sold at from 25*l.* to 29*l.*; whilst some
sheep realized as much as 62*s.* each. At these rates the
taken somewhat freely by the West-end butchers. These re
have special reference to the arrivals from Holland.
from Germany exhibited slightly improved points; but
general condition was inferior. The calves and pigs w
anything, of better quality than in the two previous years:

Imports of Foreign Stock into London during the last Six Mont of 1863.

From	Beasts.	Sheep.	Lambs.	Calves.	
Amsterdam	165	10,715	..	..	
Antwerp	46	120	..	764	
Boulogne	..	..	..	28	
Bremen	3,619	842	24	..	
Calais	..	..	..	287	
Corunna	388	..	..	..	
Dordt	4,312	18,099	5,804	342	
Gluckstadt	13	..	..	..	
Hamburg	1,628	32,705	..	24	
Harlingen	10,144	29,960	1,212	2,344	
Medemblik	1,158	30,430	..	55	
New Dieppe	131	3,446	..	162	
Oporto	536	..	..	..	
Ostend	206	538	16	409	
Rotterdam	13,162	68,600	4,454	13,078	
Tonning	24,874	27,969	6,275	4	
Vigo	1,053	..	..	..	
Total	61,435	223,424	17,785	17,497	1

The foregoing return shows a large increase in the e
from Harlingen, Rotterdam, and Tonning. From B
Dordt, &c., the shipments were likewise on an improved
The number of sheep shipped from Hamburg was about

in excess of 1862, in the last six months of which 37,843 beasts, 178,554 sheep, 12,279 lambs, 11,436 calves, and 12,232 pigs, were received from all sources into London. The statistics issued by the Board of Trade thus return the importations into the United Kingdom during the last six months of the following years:—

Imports into the United Kingdom.

Year.	Beasts.	Sheep and Lambs.	Calves.	Pigs.
1862	57,356	250,140	19,610	17,279
1861	59,049	266,249	19,715	25,919
1860	59,817	243,804	19,594	21,510
1859	48,841	192,750	14,764	9,965
1858	54,348	163,840	19,494	11,315
1857	51,155	147,096	18,273	10,172
1856	51,418	131,472	16,179	9,707
1855	55,222	142,712	14,905	11,762
1854	65,881	145,406	16,355	10,440

The quotations, taking the average of the last six months, were 2*d.* per 8 lbs. higher for beef, and 4*d.* per 8 lbs. higher for mutton, than in 1862. They compare with previous years as under:—

Average Prices of Beef and Mutton.

Per 8 lbs. to sink the Offal.

BEEF.

	1849.	1850.	1851.	1852.	1853.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Inferior	3 0	2 8	2 8	2 4	2 8
Middling	3 8	3 4	3 6	3 4	3 8
Prime	4 2	4 0	3 10	3 10	4 10

	1854.	1855.	1856.	1857.	1858.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Inferior	3 2	3 4	2 10	2 10	2 10
Middling	4 0	4 2	4 0	3 10	4 0
Prime	5 0	5 2	5 2	4 10	5 2

	1859.	1860.	1861.	1862.	1863.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Inferior	2 10	2 8	3 0	3 2	3 4
Middling	4 0	4 0	4 0	4 0	4 2
Prime	5 2	5 4	5 0	4 10	5 0

MUTTON.

	1849.	1850.	1851.	1852.
	s. d.	s. d.	s. d.	s. d.
Inferior	3 4	2 10	2 8	2 10
Middling..	3 10	3 4	3 2	3 10
Prime	4 4	4 2	4 0	4 8
	1854.	**1855.**	**1856.**	**1857.**
	s. d.	s. d.	s. d.	s. d.
Inferior	3 2	3 6	3 6	3 0
Middling	4 0	4 2	4 4	4 2
Prime	5 0	5 0	5 4	5 4
	1859.	**1860.**	**1861.**	**1862.**
	s. d.	s. d.	s. d.	s. d.
Inferior	3 0	3 2	3 2	3 8
Middling..	4 2	4 6	4 6	4 8
Prime	5 2	5 10	5 8	5 6

Owing to the fine condition in which both beasts and have come to hand, the supply of rough fat has consic increased, and the price has fallen to 2*s.* 1*d.* per 8 lbs. 2*s.* 3½*d.* in 1862. If we may judge from the quality of th in the hands of the Norfolk graziers, and the present the tallow market, there is very little prospect of fat bec dearer.

Advices from Holland and Denmark state that in a bability increased shipments of stock will be made to this in 1864. But they probably will not more than balan increasing consumption. The steady increase in our hon duction of really consumable meat will, however, preve decided advance in prices.

Newgate and Leadenhall markets have been heavily su with each kind of meat—the arrivals from Scotland a north of England having been very large—yet the tra been firm.

The state of the wool trade during the last six months briefly referred to. The unusually high prices demand cotton, arising from its scarcity, and the active inqui woollen goods for export, produced a firm market for all d tions of wool, and a rise in the quotations of 2*d.* per lb. average sales. The quantity of English wool taken b tinental houses exhibited a deficiency when compared some former periods; but their purchases of colonial were extensive scale. The market was, therefore, relieved of any in the supplies arriving from our colonies, and the bulk

:ive clip was worked up at home. In the year, two public es of English wool were held in the metropolis, and the whole the quantities offered, about 2500 packs, was readily disposed The experiment will, we understand, be repeated; but as : it has not met with much success, the prices realised at the ctions not having exceeded those offered to the growers in ·ious localities. During the whole of 1863 the importations wool into England were as follows, compared with 1862:—

	1862.	1863.
	Bales.	Bales.
Colonial	345,605	375,010
Foreign	222,063	220,316
Total	567,668	595,326

There was, it will be perceived, a slight falling off in the pply of foreign wool at hand last year, but an increase in lonial of 29,405 bales. The export trade took off about ',000,000 lbs. of colonial, 14,000,000 lbs. foreign, and 500,000 lbs. English, or in all 72,500,000 lbs. In the previous year the aggregate shipments were about 60,000,000 lbs. ne present market value of each kind of English wool is as llows:—

	per lb. s. d.		s. d.
Shropshire Down tegs	1 5	to	2 1
„ ewes	1 11	to	1 11½
„ lambs	1 4	to	1 4½
South Down tegs	1 9½	to	1 10½
Leicestershire ewes and wethers	1 5	to	1 11½
„ lambs	1 2½	to	1 6½
Somersetshire ewes and wethers	1 11	to	1 11½
Hertfordshire ewes and wethers	1 8¾	to	1 10½
Lincolnshire hoggets	2 1	to	2 2
„ ewes and wethers	1 6¾	to	1 11¼
Wiltshire, Hampshire, &c., tegs	1 10½	to	1 11
„ „ ewes and wethers ..	1 9½	to	1 9¾
„ „ lambs	1 5¼	to	1 8¾
Kent tegs	2 1½	to	2 2
„ ewes and wethers	2 0	to	2 0¼
„ lambs	1 6	to	1 6¼
Norfolk, Suffolk and Essex tegs	1 9¼	to	2 0¼
„ „ ewes and wethers ..	1 8½	to	1 11¼

The continuance of a high range in the value of money in the liscount market is calculated to have some influence upon the lemand for wool; but so long as cotton is selling at high cur-·encies, so long shall we have a steady sale for home and colonial qualities.

4, Argyle Square, St. Pancras, London.

MISCELLANEOUS COMMUNICATIONS AND NOTICES.

1.—*Swedes, Mangold, and the Steam-Plough.* By Charles Lawrence.

In the 22nd Volume of our Journal I gave some reasons for considering it desirable to invite members of the Society to communicate, in short articles, the results of any experiments they might have made, or of any special modes of treatment in the cultivation of various crops, and in the management and feeding of animals, under some such head as "Miscellaneous Communications." Reports of this description are often productive of utility beyond their intrinsic merits. They set men thinking, and thus become the origin of more important practices. I send another specimen of the contributions to which I referred, in the hope of encouraging others to do the like.

Some three or four years ago I recommended the mixture of mangold and Swedes in the same field, in another publication;* and I gave my reasons for the adoption of that course. Having occasionally since observed the admixture, adopted in various ways without attention to the special grounds on which it was recommended, I will here repeat the principles on which I adopted and have continued it with satisfactory results.

The deterioration of the Swede crop of late years has been matter of common remark; and has been attributed, reasonably enough, to the too frequent repetition of the crop on the same ground. It had been my practice, as is usual, to feed off the Swedes on the land with sheep;" which produced a heavy growth of barley, but always more or less laid by heavy rains in June and July, to the great damage of the corn, and the clover sown with it. This was a source of double mischief, requiring remedy. As the mangolds are necessarily hauled off for storing near the feeding-stalls, it occurred to me that both the difficulties which I have referred to might be obviated by growing a given number of rows of Swedes, and then the same number of rows of mangolds, alternately over the field; and by merely reversing the order of these roots when the field should come again in course for the root-crop, the result would be

* My 'Handy-Book for Young Farmers.' Longman and Co.

that the Swedes and mangold would be repeated *on the same ground* once only in eight years; and half the crop, the Swedes only, would be fed off, to the benefit of the barley. The sheep being folded *across* the lines of the root-crop, the whole field would be equally manured to the advantage of the barley. As the land requires the same preparation for the Swedes as for the mangold, there is no practical difficulty in this arrangement, though the periods of sowing vary. We drill the rows for the mangolds the latter end of April, and those set out for Swedes the beginning of June.

As a mere matter of detail, 12 rows of each are found a convenient number. If 28 inches apart, each crop would occupy a space of about 28 feet in width. If the 12 rows are pulled, and placed ready for topping in four lines, reckoning 3 feet for each line, there will be 8 feet clear on either side for the carts when removing the mangolds.

The cultivation of roots, in these days, naturally suggests to the mind the preparation for them by the agency of steam. I do not possess the requisite engine and implements, but as my farm adjoins that of the Agricultural College, I have hired their engine and Mr. Fowler's plough the last three autumns. The two first seasons we used the regular plough, turning over a furrow averaging about nine or ten inches in depth, for the ensuing root-crops. The result was the two worst crops of Swedes and mangolds I have ever experienced. I record this in order to prevent any farmer who may have screwed up his courage to hire a steam-apparatus from being hastily discouraged by a similar result from a repetition of the experiment. The comparative inferiority of the first crop under such circumstances, to a greater or less extent, is a necessary result, unless the plough be followed by the cultivator drawn by the same agency, at the same depth, once or more in the following Spring. Otherwise, the seed will be deposited in soil which has not been for ages exposed to those influences which are essential to the formation of a proper seed-bed. Any attempt to accomplish the due admixture of this subsoil with the productive soil at a depth of 10 inches by the ordinary cultivator worked by horses would be fruitless. It is only by the product of the entire course of cropping, whatever that may be, that the result of the first operation by steam-power can be justly estimated.

From the first moment I saw the plough at work, I had the impression it was not the right implement. I very much preferred the state in which the land was left by Mr. Smith's cultivator, which, according to my judgment, leaves the land in a much more favourable position for atmospheric culture during the winter, and consequently for spring tillage. Last autumn

I used what are called the *digging breasts* on Fowler's plough with much satisfaction. I regard these digging breasts as a step in the right direction towards the more effectual smashing up adopted by Mr. Smith. It so chanced that I visited his farm early in the spring, when he was commencing his operations on land turned up by his implement in the previous autumn, and I had an opportunity of comparing the state of it with that of mine, which had been turned down by the steam-plough at the same season. I consider my land naturally superior to that which surrounds Mr. Smith's farm, and much more easy to cultivate; but while my deep furrow remained unbroken, there having been very little frost during the winter, involving the necessity of expensive and repeated cultivation, with a most un-unsatisfactory seed-bed at last, I found Mr. Smith actually drilling his beans in an admirably prepared soil, the drill preceded by cultivating tines on the same frame as his drill, on the land smashed up by his machine the previous autumn, without any intervening operation. It is true that Mr. Smith's land had undergone a similar autumn preparation in a previous course; but it was clear to me that the actual working condition of his land resulted chiefly from the greater extent of surface favourably presented to atmospheric influences during the winter.

Cirencester, January 23rd, 1864.

2.—*Method of converting old Barns into Cattle-Boxes.*

"*To* P. H. Frere, *Esq.*

"Dear Sir,—As you asked me to send you an account of my method of converting old-fashioned barns into cattle-boxes, I beg to hand you the following short paper, with an illustration, referring to a barn fitted up on my own property at Bursledon, near Southampton.

"Having during the last seven years thrashed the whole of my corn by steam-power, and believing that corn is generally better placed in ricks than in barns for that purpose, and my barns having been empty during ten months of the year, I have adopted the practice of feeding cattle of different ages in them, as I invariably cut my clovers for soiling stock in the green state, instead of incurring the expense and risk of making hay. I have found there is no accommodation for feeding cattle under cover equal to that afforded by an old-fashioned thatched barn, which is warm in the winter and cool and healthy for the animals in the summer; and although I have designed and built upon properties under my agency cattle-boxes upon the newest

and most approved principle, and have also seen some of the best cattle-feeding establishments in the kingdom, yet I assert that practically, for both summer and winter feeding of cattle of different ages under cover, I have seen nothing to equal the advantages to be derived from an old barn properly fitted up, the roof being usually so much higher than that of buildings specially designed for box-feeding. The accompanying illustration exhibits what was originally a barn, with straw-house attached; the barn-part is fitted up so that it may be filled with corn at harvest, and it has been thus used during the present season—the corn was threshed out at the end of six weeks, and it has since been occupied by both store and fatting cattle. It will be noticed in the sketch that the rails dividing the boxes are made to take apart.

"My estimate of constructing the boxes is as follows:—

	£.	s.	d.
Required 6 rails of fir poles, 11 feet long and about 3½ inches diameter, with ends chopped square to fit into the supports, say 6*d*. each	0	3	0
Two upright fir posts, 8 inches diameter, let into the ground 2 feet, and screwed at top to tie-beams of barn, at 3*s*. each	0	6	0
12 iron brackets made of ½ by inch wrought iron, at 8*d*. each	0	8	0
2 slabs, 10½ feet long, at side of feeding path, 2*s*. each ..	0	4	0
10 yards of cube digging	0	5	0
Carpenter's wages for erection, &c.	0	3	0
Total cost of each box	£1	9	0

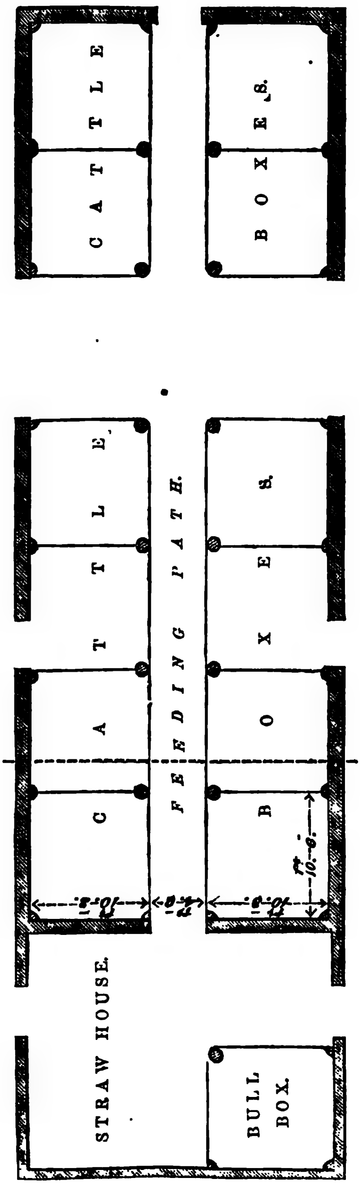
"This must be considered a very moderate amount, and it may be further diminished upon all soils, excepting gravel or stone, by breaking up the bottom of the boxes; which, after being saturated with the liquid-manure, may be removed with the dung when the boxes are cleaned out; this, being repeated a few times, will excavate the boxes to the required depth of 2 feet.

"In most cases it will require care not to disturb the ground-pinning brickwork; I therefore leave about 8 inches width of soil next to the brickwork.

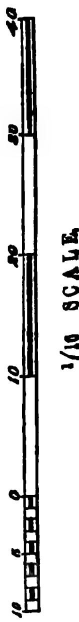
"It will be found that the barn-floor, being 13 feet by 24 feet, affords ample room for the cutting of turnips, chaff, &c., and also store-room for a considerable quantity of roots and hay, and the feeding-path leading from the floor gives access to all the boxes alike.

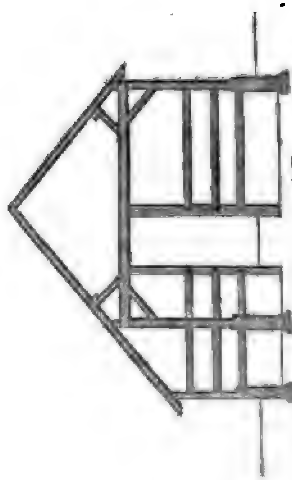
"The accommodation requisite for cattle whilst feeding under cover is so much on the increase, that the question how boxes can most readily and economically be furnished is interesting to both landlord and tenant; the former, although desirous of encouraging the latter to keep a larger number of cattle, may

hesitate before putting up new buildings for the purpose, but may fairly point out to the tenant the purposes to which the ordinary barns of the farm may be converted.



PLAN OF OLD BARN FITTED UP WITH CATTLE BOXES.





Section on line A B.

the same time the cost is so small, as I have here shown, v tenants would object to fitting up barns in the manner ed, if the landlord granted permission and at the same lowed some of the materials.

"JOSEPH BLUNDELL, Land Agent, &c.

rsledon, Nov. 26th, 1863."

—*On Regulating the Sex of the Offspring of Animals.**

e be any device for regulating the sex of the offspring of cks and herds, every breeder is interested in knowing it; f a hint can be given which only improves his chance, t costing much trouble, it still is a boon.

ould seem from the following testimonial that Professor of Geneva had got some insight into one of the factors enter into this complicated and mysterious problem :—

G. Cornaz, manager of the property of my deceased M. A. Cornaz, late President of the Agricultural Society man Switzerland at Montet, Canton de Vaud, hereby that I received from M. Thury, Feb. 18, 1861, a paper ing confidential instructions for the purpose of making a al experiment to ascertain the law which regulates the the offspring of animals.

have applied these directions to my herd of cows, and btained at once, without any tentative trial, the desired

the first instance, in 22 successive cases, I endeavoured in heifer-calves. My cows were Swiss, and my bull a Durham. Heifer calves were, therefore, in request—bull only fit for the butcher; *in every instance I obtained the result.*

ter, when I had bought a pure-bred Durham cow, I was s to breed a bull to take the place of the one which I had at a large price. Again I acted according to Professor s directions, which are ready of application, and again I ccessful.

sides my Durham bull, I designedly bred 6 half-bred r the plough from cows selected for their colour and size. rd comprised 40 cows of all ages.

n the whole I have tried the new directions twenty-nine and in each case obtained the desired result, male or ; I have had no instance of failure. I personally watched

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* the materials on which this and the following papers are based the editor ed to the 'Journal d'Agriculture Pratique.'

each trial. I can consequently declare that I consider Profe Thury's system to be real and certain, and I hope tha breeders will speedily profit by it.

"Drawn up at Montet, February 10, 1863.

"(Signed), G. CORNA

We may learn from a pamphlet of Professor Thury, the Law which regulates the Sex of Plants and Animals,' is his scientific theory, and what are the practical direc which he deduces from it.

The following statement is a brief summary of his v Starting with the vegetable kingdom, Professor Thury a the theory of Knight, who, in concert with Wolff, De Can and Robert Brown, considered stamens and pistils to be fu mentally identical (both being modifications of the leaf) further regarded the production of the male organ in pla due to greater maturity or more perfect development.

Considering how general the laws of Nature are, the fessor infers that the propagation of animals follows an logous course. He states that it has already been adı that for certain oviparous animals the last hatchings pr males; that Huber recognized as fact that early fecun produces female bees, and *vice versâ;* and so from one st another he arrives at the conclusion that an egg yet unim nated, is female during the first part of its passage down matrix, and male in the last part. The sex, then, of the cr will depend on the degree to which the egg is matured moment of fecundation. He therefore considers it to general law that fecundation which follows shortly after " or menstruation breeds female offspring, and *vice versâ.*

The following are his directions and cautions :—

1. The peculiarities of different cows should be observe taken into account. The number of hours during whicl take the bull varies from 24 to 48. To obtain a heife first part of this period is selected; for a bull-calf, the part.

Exceptional animals, such as are fat or tied-up, afford n criterion; but healthy, well-conditioned specimens, livi the open air, should be selected for experiment.

These views must only be taken for what they are wort far as the result depends on the mother, and she is a fair sentative of her sex, the hint may be serviceable; but th sex of the offspring is quite independent of the sire, as is assumed, is a doctrine which will not pass unchallenged.

. will conclude this notice by an extract from a letter addressed me on this subject by Professor Wilson:—

"It is very desirable that these principles should be properly ted on a sufficiently large scale, and by reliable persons who uld themselves take care that the advice given should be rrectly followed. A few years' experience would then enable to determine whether M. Thury's deductions are valid as law."

ι.—PROFESSOR VILLE'S *Experiments on the Growth of Wheat.*

: may be well for the same Journal which records the nportant results of Mr. Lawes' continuous experiment on ιe growth of wheat, to make some mention of trials now in rogress in France, undertaken with a similar aim and resting ı a somewhat similar basis.

M. Ville has been for some time known as a man of science ho had turned his attention to vegetable physiology in con- ction with chemistry, and his experiments for testing the nditions of the growth of plants in artificial soils and atmo- heres have excited the more notice because the results he tained were at variance with those of Boussingault and others.

M. Ville affirms with increasing confidence the doctrine that ants can, to some extent, feed directly upon the nitrogen in e air; a belief which Boussingault seems to have been con- ained by his own most accurate experiments to renounce, even regard to that tribe of plants for which he had formed vourable anticipations.

That zealous patron of Agriculture, the Emperor of the ench, has installed M. Ville in a Professorship of Natural ilosophy at Paris; has provided for him a splendid laboratory a scale which rivals Rothamsted; and, to complete the rallel, has put at the disposal of the Professor trial-fields at e Imperial Farm of Vincennes, where the doctrines of the ass-room are set forth in field doctrines, and illustrated by owing practical results. The three varieties of plants have been lected for a continuous experiment in the same soil with the me chemical fertilizers: wheat, to represent the cereals; peas, r the leguminosæ; and beet-root.

These trials have already been maintained for three years; ıd the wheat crop, now to be recorded, is the third produced in ree successive seasons from one dressing applied in December, 360.

It has been objected to Mr. Lawes, by Baron Liebig, that his cts have been verified only on one class of soils; and the jection, so far as it is correct, is important: it is therefore a ppy circumstance that the land assigned to M. Ville is

a very porous sandy loam resting on gravel which contrasts favourably with the clayey loam that overlies the chalk at Rothamsted. In the words of M. Barral, "Le sol en est argilo siliceux, de consistance assez légère mélangé de gravier, avec un soussol formé d'un gravier assez compacte." This is evidently a poor soil, and therefore well suited for testing the relative action of different manures. In one respect, however, it seems doubtful whether the French trial-field, situate on the skirt of the Wood of Vincennes, be a good representative of general husbandry; for if it be new land—a recent clearing on which humus has more or less accumulated, the advocates of the mineral theory will hardly have pitched upon a fair field of battle.

Preparatory to the experiments, the soil was stirred to the depth of from 8 to 10 inches by the hand-grubber (la bêche) a short-handled picker, with either a broad point or with bent prongs,—a most effective implement in the hand of the peasant proprietor for autumn or winter cultivation.

M. Ville's design is to test manures of four different classes, nitrogenous, phosphatic, calcareous, and alkaline, in varied combinations, and in contrast with the unmanured soil.

To this end, directly after the grubbing, the trial wheat-plots (1 are = 4 poles nearly) received in December, 1860, the following dressings as here computed for the English acre:—

	lbs.
Muriate of ammonia	579
Phosphate of lime	352
Double silicate of potash and lime	328

The muriate of ammonia was derived from the sal ammoniac of commerce, it contained 24·92 per cent. of nitrogen; this supply was reckoned to correspond with that furnished in 10 tons 18 cwts. of farmyard manure. The phosphate of lime was obtained from the precipitation of chloride of calcium by phosphate of soda; it was consequently a very pure and fine substance. The double silicate of potash and lime was provided by M. Kuhlmann, of Lille, and [illegible] potash, one-third of lime, [illegible] The cost was [illegible]

[illegible] (two [illegible] each [illegible] hectare [illegible]

[illegible] speaks of [illegible] of the experi- [illegible] part which each [illegible] development of

he plant, and the consequent shortcomings of partial dressings; he absolute necessity of nitrogen for wheat, of silica for peas, ind of potash for both one and the other, being thus forced upon he view. But we have a more severe and perhaps a more experienced witness and critic than these in M. Barral, the Editor of the 'Journal d'Agriculture Pratique.'

That accomplished Editor, it appears, has occupied a position in some degree antagonistic to M. Ville, being in part influenced "by his reverence for an illustrious savant (Boussingault), whose opinions M. Ville had attacked." A sense of public duty almost *constrained* M. Barral to visit Vincennes, where he was courteously received and urged to inspect in person the harvesting of certain of the trial plots. The general survey, and the table of results which follow, rest upon his excellent uthority. "A glance at the different plots," he writes, "was ufficient to show, that where a dressing of manures, complete ccording to M. Ville's view, had been applied, the crop would xceed 30 hectolitres (33 bushels per acre), and that on the other lots the yield would fall much below 20 (22 bushels).

He further states:—"On the 23rd of July a square which ad received the complete manure was cut and thrashed in my resence, and on the 30th of July one-half of another plot which had only received phosphate of lime. On that same day the crop on an unmanured plot, which had been previously cut, was also thrashed." (These plots were part of the third successive wheat-crop from land cultivated and manured in 1860.)

The seed had been sown by hand at the rate of rather more than 1½ bushels per acre in lines about 5½ inches apart. Each experimental plot (are) contained 8 beds a metre (39 inches) wide, having 7 drills with a path nearly 13 inches wide between the beds, a cord being fixed round each bed to support the ears.

The plots tested varied in extent from 4 poles (the unmamured) to about 105 square yards (for the complete manure), and 60 square yards (for the phosphate). M. Barral gives the details in full, but it will best suit our purpose to give only the results as adjusted to our own measures and weights:—

— per Acre.	Ville's complete Manure.			Phosphate of Lime alone, 352 lbs.			No Manure.		
	lbs.	cwts.	lbs.	lbs.	cwts.	lbs.	lbs.	cwts.	lbs.
. .. ..	5670=	50	70	1584=	16	28	1821=	16	28
rt stuff ..	645			264			290		
.. ..	3324=	19	80	862=	7	78	721=	6	49
ls	57·5			14·4			12·2		
	Kil.			Kil.			Kil.		
tolitre ..	79·5			75·			74·5		

These results, adds M. Barral, speak for themselves. To obtain such an excess of produce for three successive years, if it has been done for three years, at a cost of from 8*l.* to 9*l.* per acre, is magnificent.

Due allowance must, however, be made for the effect of the trenching, and of the subdivision into squares (and possibly for an unusual supply of humus), but otherwise it would seem that if a mixture of chemical manure, such as may be represented by nitrate of soda and phosphate of lime, with the addition of some potash, gave good results on such a soil as this, we may hope to find them generally effectual. The four principal elements are thus provided: other constituents are not less necessary, but in such small quantities that most soils have already a sufficient supply.

The real importance of these minor constituents is well illustrated by some experiments on the minute must-plant (*Ascophora nigrans*), conducted by Professor Raulin of Brest, as quoted by M. Barral. The Professor writes, "By a judicious choice of mineral substances, this plant may be made to develope itself in an artificial medium as rapidly as in its most appropriate natural fluids. Vegetation continues till one constituent runs short. The mineral substances requisite may thus be stated in their order of importance—Phosphorus, Potash, Magnesia, Sulphur, Manganese. These were supplied in the form of phosphate of ammonia, carbonates of potash and magnesia, sulphate of potash and carbonate of manganese. If a fluid which contains all these substances will produce, say 20 grains of this plant, one that only differs from it by the absence of manganese will then only produce 5 grains in the same time; if sulphur be withheld the product will only reach 2 grains; if magnesia or sulphur, only 1 grain; if phosphorus, only half a grain. The required amount of these substances is very small, amounting to not more than 2 per cent. of the plant's bulk of even phosphorus, which is most in requisition; there are probably yet other substances which likewise enter into its constitution, but in still smaller degrees." This illustration of the wide difference which subsists between manures which are practically complete, and those which fulfil the rigorous scientific conditions of completeness, may fitly close this notice of signal, if not exceptional, success obtained by the use of artificial manures on a light porous soil.

5.—*The Artificial Fecundation of Cereal and other Crops.*

MUCH interest and discussion has been excited of late in France by M. D. Hooibrenk's proposed methods of increasing the produce both of corn and of fruit-trees, which have attracted the attention of the Emperor, have been investigated by a special

commission of the highest character, have been the subject of several official documents published in the 'Moniteur,' and have been honoured with a special notice in the 'Ministerial Report' on the present status of the Empire.

Our agricultural press has, from time to time, given currency to much of this intelligence, yet it may be well to lay it before our readers in a combined form, much condensed, freely rendered into English rather than closely translated, the quantities being given in English weights and measures, that the report may be intelligible to the ordinary farmer, which *otherwise is not the case.*

Since the experiments which affect corn-crops concern us more than those made on vines and fruit-trees, our attention will be restricted to the former class.

The practical aspect of the question will best be gathered from the careful directions issued by Marshal Vaillant, as head of the Commission, to ensure completeness for the fresh trials which are to be made in 1864 at the Imperial farms, at the leading agricultural colleges, and on the estates of some distinguished agriculturists.

If the results obtained by one series of tests may be thoroughly relied on as representing the average effect produced on large fields of similar quality, treated alike, M. Hooibrenk will have converted one of the curiosities of garden practice into a most important feature in the management of the farm. It is, however, unfortunate that a second test, emanating from the same high authorities, more accurately executed, but on a still smaller scale, gave results much at variance with the first.

In 1863, the chief experiments have been conducted on the well-known estate of Sillery, in Champagne, the property of M. Jacquesson, a gentleman of the highest character and position, who invited M. Hooibrenk to take up his residence in France. The experiments were there tried on a large scale for wheat, rye, oats, and barley, growing on 200 acres, in fields of 37½ acres and upwards. In these fields two-and-a-half acres were left in their ordinary state, and the rest operated upon. The plots hitherto *tested* have, however, contained only 4 rods and a square mètre (39 inches) respectively, so that we may look for the result of the thrashing of the general crops with some interest.

Let Mr. Hooibrenk first state his theory respecting artificial fecundation in his own way. He teaches us that: It is not so simple a matter as it appears at first sight, to decide whether a crop is in flower or not; as your decision depends on the direction in which you walk, the stamens which turn to the east or the south being commonly developed before those on the west and north sides.

It is a general rule in the vegetable kingdom that the pistil or

female organ is ready to be impregnated before the pollen on the stamens is matured. Here, as in the animal kingdom, the female organ is the more precocious; it is also the more susceptible of injury from rain, fog, frost, or insects, which may disturb the little honey-drop placed on its tip to receive the pollen and transmit it to the ovary—the seat of the embryo. If this drop have disappeared, the advent of the pollen can do no good.

The pollen, on the other hand, has such a hardy constitution that it may be kept for seven or eight years without losing its efficacy.

To remedy, as far as possible, this risk of injury, the fringe used in the artificial process is moistened with honey, which is the same substance as this drop—for the bees *collect*, but do not convert their store.

The law of cross-breeding applies as well to cereals as to all other produce; and the grain which is impregnated with pollen from a neighbouring ear is always finer than that which has received the pollen from the same ear.

The following is a summary of the advantages to be derived from the artificial process:—

1. The happiest moment is chosen for the fecundation, instead of waiting for a breeze, which may not approach till the pistil has been impaired.

2. Whereas, in a state of nature, a good many ovaries are fecundated on the first day, on the second day not so many, on the third still fewer, and so on for a week or even ten days, by the artificial process, all that are ready are impregnated at once, and nearly all the rest (those to the north and west especially), within three or four days; the grains therefore ripen, and are fit for harvesting together.

3. Whereas, in the ordinary ear the grains are largest at the bottom, and diminish as they mount upwards, until the topmost spikelets are empty and unprofitable, "fecundation" makes all the grains equal in size from bottom to top, and on all four faces of the ear—all the spikelets are full, and the ear is as square as possible.

4. The artificial process adds force and vigour to the whole plant.

The Commission issued by M. Behec, Minister of Agriculture, included M. Payen, the famous chemist and philosopher; M. Dailly, a practical agriculturist, member of the Central Society of Agriculture; M. Lefour, the late President of the International Exhibition at Lille; with M. Simon, Chief Secretary to the Minister.

Three Commissioners visited Sillery on the 24th of July, and in their presence trial plots of 4 rods each of wheat and rye

were cut, thrashed, weighed, and measured: the barley and oats were not then ripe, but a few days afterwards they underwent the same test in the presence of the Communal authorities.

The results which then obtained the sanction of the Commission (*ont été officiellement constatés*) were highly satisfactory to the experimenter, who felt warranted to state that his process had, on an average, added 50 per cent. to the corn-crop, and that, in a fine season, when artificial aid would be less telling than usual.

On the 10th of August the Commissioners read their Report to the Central Society of Agriculture; up to the end of 1863 this Report had not yet been published. After this Report, M. Dailly (the practical agriculturist of the Triumvirate) read a memorandum relating to a second testing, which was published in the 'Journal d'Agriculture Pratique,' from which the following passages and calculations are extracted:—

"The produce per are (4 poles), of which you have just received the report, as tested at Sillery, on the 24th of July last, by M. Payen, M. A. Simon, and myself (M. Lefour being prevented by illness from accompanying us), corresponds with the following crops per hectare.

	Per Hectare.		Per English Acre.	
	Hectolitres.	Kilogrammes.	Bushels.	lbs.
Wheat fecundated*	41·5	3100	46	2728
Wheat not fecundated	30·5	2100	34	1848
Rye fecundated	34·5	2550	38	2244
Rye not fecundated	22·6	1600	25	1408

"If the number 100 represents the fecundated wheat and rye crops, the natural crop of wheat will be represented in bulk as 73·49, and in weight as 67·74; and the rye-crop in bulk as 65·50, and in weight as 62·64.

"We thought it would be well to try whether the produce obtained on a square mètre (39 inches) corresponded with those already determined on the plots of one 'are' each. The four plots were cut before our eyes, and the stalks gathered on each were tied up and ticketed."

M. Dailly then states very minutely the extreme care with which one-half of each of the four bundles was examined at Paris; the amount of straw, "short stuff," chaff, and grain, the number of stalks of corn and stems of weeds, and the number of grains required to fill a small measure—being carefully recorded. This second trial, reduced to the same standard, gave results as follows:—

* The wheat field, 37½ acres, had received 20 tons per acre of farm-yard manure, according to the custom in Champagne. The rye, also 37½ acres, followed a wheat-crop, no manure at all had been applied.

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	Per Hectare. Hectolitres.	Per Hectare. Kilogrammes.	Per Acre. Bushels.	Per Acre. lbs.
Wheat fecundated	35·00	2550	39	2240
Wheat not fecundated ..	32·00	2340	36	2059
Rye fecundated	28·40	2000	32	1760
Rye not fecundated	17·00	1200	19	960

Or, if as before, the fecundated crops be represented by 100, then the natural wheat-crop is now represented in measure as 91·42, in weight as 91·76; and the rye-crop in measure as 59·89, in weight as 60.

The half-bundle of the wheat left to nature contained 215 ripe and 7 unripe stalks, in all 222, with two stems of weeds; its competitor had 225 ripe stalks and 13 weed stems. With the rye, the natural crop had 142 stalks of corn, many of which were blank, and 22 of weeds; its rival had 242 stalks of ripe corn, and 16 of weeds. M. Dailly aptly remarks that the produce appeared to vary as the number of stems; whereas the artificial process could exert no influence except on the number and weight of the grains in a given number of stems.

Of the natural wheat-crop only 166 grains were required to fill a centilitre, as against 175 grains of the rival parcel; but of the natural rye-crop it took 259 grains as against 247.

It is elaborately calculated that the natural wheat-ear averaged 12 grains as against 13; and the natural rye 14 grains as against 15.

The reader may, by a little attention, see for himself how considerable the discrepancies are between the results of the two trials; and if the smaller bundles were a fair sample, how small was the advantage gained in the quality of the ears. These reports, which emanate from nearly the same authority, are perplexing, if not discouraging. That which is favourable to M. Hooibrenk has the advantage of being based on the larger trial of the two. Meanwhile there are many indications that the question, though still an open one, is considered to possess much interest and importance. The following instructions, issued by Marshal Vaillant (which are here slightly abridged), bear sufficient testimony to this.

Instructions for the Conduct of Experiments designed to test M. HOOIBRENK'S *Method of Artificial Fecundation, &c., of Cereals.* (Extracted from the 'Moniteur,' November 14th, 1863.)

M. Hooibrenk recommends the adoption of two distinct processes:—

1st. Rolling the corn three or four times after it is up; and
2ndly. Artificial fecundation at the flowering season.

The first rolling should be done shortly after the corn is above

ground, when it is about 3 inches high; the second and third severally at a week's interval.

They should be performed at a slow pace, and on a day which, according to the usage of the district, would be considered favourable for the purpose. The same track should be followed each time and in the same direction, that the stems may be bent to the same side.

Autumn corn which has been rolled before winter should have one or two more rollings in spring, when vegetation revives. The roller should be grooved; it should be weighted according to the nature of the soil and the custom of the neighbourhood. (Experimenters will have a pattern roller delivered to them.)

If the autumn corn is "thrown out" by winter frost, the common roll of the country should be used to set it firm again.

Rape and maize are not to be rolled.

Artificial fecundation is put in operation when the plant begins to flower.

It is effected by a rope 25 to 30 yards long; to this rope are attached pieces of woollen twist (*torsades de laine*) 2 feet long, so as to touch each other and form a continuous fringe. A little piece of lead, the weight of a swan-shot, is fastened to one of the threads at intervals of 4 inches. The wool employed should be long and coarse.*

The threads are smeared with a small quantity of honey by drawing the fringe through the moistened fingers.

To effect artificial fecundation the apparatus is drawn over the corn. The fringe ought to trail over the whole length of the ear, so that each spikelet, from the highest to the lowest, be brought into contact with its threads. The workmen should also, as they walk, make the rope shake the ears slightly. Three men are required for the work: two, placed at either extremity of the rope, draw it along; the third supports it in the middle, and gives it a slight lateral to-and-fro movement. This operation is repeated three times, at an interval of one or two days, and in calm weather. The first time it ought, as far as possible, to be performed from east to west, the second time from west to east, and for the last time the farmer may follow his discretion.

If there is dew or frost, the work should not begin before 10 A.M.; it should not be done in the rain.

The crop should, in all other respects, be treated according to the general practice of the neighbourhood in respect of tillage and manuring.

For rapeseed, buckwheat, and maize, the same rope and the

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* The rope complete may be bought of M. Boucley, Rue Montholon, No. 34, Paris.

same procedure may be adopted, except that for maize the leaden weights should be heavier.

The apparatus should be washed after being used for each variety of plant.

That the influence of each of M. Hooibrenk's suggestions may be distinguishable, and clearness and precision given to the results sought, the Commission suggests that the experiments should be made in the following manner:—

The fields selected for experiment should, as far as possible, be similarly circumstanced as to soil, manure, tillage, and aspect, and apart from woods, roads, and avenues of trees.

Each field should be divided into four plots.

To the first, the ordinary management of the district should be applied.

On the second, rolling, but not fecundation, should be tried.

On the third, both the roll and the fringe should be used.

On the fourth, artificial fecundation should be tested without rolling.

The experimental plots may be restricted to a square measured off in the centre of an irregular field, or to four "lands" of like quality.

The crop should be harvested at the same time and in the same manner on all four plots; the head and tail-corn, the straw and the short stuff, should each be separately ascertained.

At harvest time the number of stalks should be counted which are growing on one square mètre of ground of average character in each of the four plots.

All these stems should then be carefully pulled up, so as to preserve their roots, and they should be made into a bundle, labelled . . . . and forwarded to the Commissioners.

The experimenter is to fill up a schedule, of which a copy is furnished, and send a description of the field and its position, with an account of the fluctuations in the yield of the cereal under trial for a series of years on that spot; of the yield of other portions of the field or fields not under experiment; of the cost of the men and horses employed in rolling and fecundating the field; and he is invited to give his opinion of the value of the measures which M. Hooibrenk advocates.

One word of comment respecting the rolling referred to may be of use. In the vineyard and orchard much of M. Hooibrenk's art consists in giving to the side branches an inclination of 112 degrees. This idea has been imported into his cereal experiments, where it is, perhaps, less at home, seeing that rolling must cease before the stem is developed. This portion of the

periment is not as novel or as interesting as the other; since, ithout connecting our practice with this new theory, good rmers have not overlooked the use of the roll, so far as leisure id a happy moment could be found.

It will, however, be useful to have the effects of *repeated* rollings eparately investigated and carefully recorded.

6.—*The Leporide.*

Both the farmer, who is more and more conversant with cross-breeding, and the naturalist, who cannot stand apart from the existing controversies on "species," are interested in the practical development given in France of late to a race of hybrids between the hare and the rabbit, which bears the name of "Leporide." This half-bred has been reared during the last seventeen years under the management of M. Roux, President or Vice President of the Agricultural Society of Charente, who appears to be an intelligent but unscientific and unobtrusive landed proprietor. Its fame has been spread abroad by M. P. Broca, a French naturalist, in a treatise on Hybridising, published in 1859,* who twice visited and inspected M. Roux's establishment, and carefully weighed his explanations.

It appears that among the recognised hybrid animals are found (in addition to the mule) the offspring of the he-goat and the ewe; of the setter-dog and the bitch-wolf (of which breed four generations were reared by Buffon); of the camel and dromedary; Buffon's crosses between the ox, bison, and zebra; and those also obtained by John Hunter from dogs, jackals, and wolves.

Moreover instances have been already recognised of a hybrid birth from the hare and rabbit: between 1773 and 1780 the Abbé Gagliari, near Oneglia, bred from the *buck-rabbit* and the *doe-hare*, and Amorretti recorded the results in 1780. In 1831 the London Zoological Society received a communication relating to the chance birth of a hybrid from the buck-hare and doe-rabbit.

In this case a leveret had been reared with two young rabbits, buck and doe. The doe bore a litter of six young ones, of which three were common rabbits and the other three resembled the hare. One of the latter alone survived, and some years after was dissected by Professor R. Owen, whose examination settled the previously existing doubts as to the hare having been its sire. Its intestines, it is said, corresponded neither with those of the rabbit nor the hare; the great bowel differed but little from that of the rabbit, the smaller one was that of the hare. The skin

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* 'Recherches sur l'Hybridité Animale en général.

resembled that of the hare, but the hind limbs were like those of a rabbit, and the flesh was white. Owen recognised it as a hybrid.

That hybrids may be produced between these two animals seems not to be disputed; but that hybrids should be prolific and breed one with the other, or with either parent stock, has been a point of acrimonious contention, which is not the less bitter because it is prompted by a motive to which respect is due.

It has been a dogma of the Naturalists that hybrids of different species are sterile, and the hare and rabbit are classed as belonging to different species; moreover, points of religious belief have got mixed up with the Naturalist's creed respecting "species." So M. Roux and his reporters have been libellously assailed, and the truth of their assertions tested, and, as it seems, confirmed.

M. Roux's object in his cross-breeding was to unite with the prolific character of the rabbit some of the superior qualities of the hare. With this view the doe-rabbit was at first preferred (the doe-hare being a very shy breeder in confinement, besides being less prolific), and further modifications in the race were afterwards introduced. The first cross very nearly resembled the rabbit; the females among them were then put to the buck-hare, and their produce were "larger and stronger than either father or mother," yet in appearance they were only half way between the hare and rabbit. M. Roux next bred from this second generation ("*inter se*"), and the offspring resembled their parents, but the litters diminished in number down to from two to five; so a little more rabbit blood was thought desirable, and the does, three-quarter hare, were put to a half-bred buck. The result was quite satisfactory—the produce exhibited the handsome features and form of their mother, and they were prolific. When they were further bred from "*inter se*," the litters numbered from five to eight, and they were more hardy even than the rabbit, and easily reared: they grow fast, are precocious, and will begin to breed at four months. The gestation occupies thirty days; they suckle for three weeks: twenty-seven days after the last birth the doe may be put to the buck, and can very well rear six litters in a year.

It is stated that this breed supplies a large amount of meat for the food consumed; sold at the age of four months they make two francs in the market, when the warren-rabbit fetches only one franc. When older their skin becomes more valuable than that of the hare, and commonly sells for one franc. At a year old they generally weigh from 8 to 11 lbs.; picked specimens have attained to 12, 14, and even 17 lbs. With results such as these, M. Roux considered that he had reached his aim, and this new stamp of animal was to be retained and maintained.

To breed these animals the following course must be pursued:

a leveret should be caught between twenty and thirty days old, when he can live without being suckled; he should be kept with some young doe-rabbits of his own age, quite apart from any other animals: he will grow up with them, but continue to be more shy than they. When they are of an age to breed, all the does, except one or two, should be withdrawn, and shortly these will be with young; they may then be removed and some of the others brought back. The hare will after this be generally kept by himself, and the doe will be brought to him at night, when all is quiet, and a covering will be put over the bars of his hutch.

It appears that the number of the young at a birth depends on the sire as well as on the dam: a doe-rabbit put to a hare, instead of rabbit, will bring forth five to eight, instead of eight to twelve young ones; and again, as already stated, a buck hybrid of half-rabbit blood increased the numbers of the quadroon litter. This stock has now been kept up through some fourteen or fifteen generations, and in consequence of the pains which have been taken to avoid too much of breeding "in and in" they have not fallen off in size or appearance.

M. Broca speaks of M. Roux as a gentleman who has no pretensions whatever to scientific knowledge, and yet reports that his whole account of the course of events tallies exactly with that which an enlightened physiologist, familiar with the laws of "*Hybridity*," would have anticipated under the circumstances; and this he considers to be in itself strong evidence of the truth and accuracy of his statements.

If our readers who are breeders of stock, have had patience to proceed thus far, a word may suffice to point out to them that, whatever be their flock or herd, they have a personal interest in the broader features of this subject. Extreme cases are best qualified to throw a light upon the mysteries of cross-breeding, and to aid the investigation of the "laws of hybridity." The less the affinity, the broader the contrasts between the two parents, the more manifest and distinct will be the part which each plays in moulding the nature of the offspring.

The hare and the rabbit are so little akin, that the idea of any fusion between them has been a stumbling-block to orthodox science. If we are satisfied that both the buck-rabbit and doe-hare, and also the buck-hare and doe-rabbit, have been successfully brought together, either of these two phases will be worthy of examination, and the one will illustrate the other. M. Roux's hybrids of different degrees, originating with the doe-rabbit, have all had white flesh, like that of the rabbit in colour, though different in flavour (Gagliari's, bred from the doe-hare, had red meat); their coat is said to resemble the hare in its texture, but its colour is

intermediate, a reddish grey; the ears are as long as those of the hare, with this peculiarity, that in many instances one ear is erect, the other pendent; their heads are larger than those of the rabbit, the eye more prominent and placed nearer to the nostrils; the hind-legs are said to resemble the hare (Prof. Owen's report, as we have seen, differed in this respect), the fore-legs are longer; the length of tail is intermediate. The rabbit-blood, through the male or female alike, appears to give and maintain a prolific character, that of the hare to impair it.

From such considerations M. Broca has been led to adopt a distinction in the physical constitution, suggested by Bichat, between the relative (or animal) life and the organic (or vegetative) life, and to consider that in hybrids the former is chiefly influenced by the sire, the latter by the dam. The expression "*relative life*" seems intended to signify all that tends to bring the animal into *relation* with external objects—the organs or instruments of perception, will, locomotion, sensation; whilst on the *organic life* depend digestion, secretion, nutrition: that is to say, the formation of tissues through the blood in like manner as wood is formed by sap, whence organic is nearly synonymous with vegetative life.

One illustration of the use to which such curiosities of physiology may be put by farmers may serve as a fitting conclusion to this statement. We have lately had before our eyes an interesting lecture on the breeding and management of sheep from Mr. Woods, agent to Lord Walsingham. The practical aim of this address is especially manifested by the special notice it directs to cross-breeding, as generally practised in Norfolk, rather than of the management of his Lordship's first-rate Southdown flock.

Mr. Woods raises the question whether farmers should not rather put a down-ram to long-woolled ewes than continue to follow the converse practice. Now, if the flesh distinctly takes after the dam, and "the consistence of the pelt" be that of the sire, it would seem that we should lose rather than gain by the change suggested. So far as quality of flesh is concerned, the down-ewe is decidedly preferable, for the butcher values dark meat, particularly in young animals; so far as perception, and will, and sensation influence the temperament, a placid long-woolled sire will answer best. With respect to the wool, there may be a doubt whether we should refer its character to the sire or to the dam; yet this theory appears to support the preference given to the sire bearing a heavy fleece. At all events, breeders may get some food for meditation from the records of Cagliari's and Roux's respective forms of hybrids.

XII.—*Agriculture of Hertfordshire.* By H. Evershed.

Prize Essay.

ERTFORDSHIRE enjoys the climate of an inland southern county. s soil is generally of fair quality, and capable of being made 'oductive by liberal farming. It is rich in woods and timber, hich, if not conducive to improved farming, are by their luxu-ance evidences of good land, and must be reckoned among ιose local attractions which have caused an unusual number of ›untry seats to be scattered over the county.

The soil, which, except when the chalk comes to the surface, clay, or a mixture of clay, loam and gravel, oftener heavy than ght, is usually well provided with natural drainage by the umerous streams, by inequalities in the surface, and by the halk substratum which underlies nearly all the county at various epths.

The proximity of London has for generations given a stimulus › some branches of its farming; and of late years fresh encourage-nent has been derived from railways and the increased require-nents of the metropolis. The population in 1851 was 173,962, n 1861, 177,452. The area is 428,143 acres.

We are obliged to Mr. H. Thurnall, of Royston, for the follow-ing statistics on the climate:—

Rainfall at Royston, in Herts, during the Years 1860, 1861, 1862, and 1863.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Remarks.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
1860	2·591	1·130	2·176	1·379	3·413	4·45[illegible]	1·419	3·847	3·031	1·211	2·431	2·476	29·556	Above average.
1861	1·299	2·057	1·912	0·826	0·969	1·90[illegible]	3·291	0·656	1·032	1·083	3·424	1·362	19·814	Below do.
1862	1·709	0·409	3·066	1·883	2·992	1·909	1·188	3·039	2·009	2·698	1·411	1·525	23·928	About do.
1863	2·793	0·322	0·668	0·595	0·953	2·479	0·530	2·191	1·980	1·696	2·396	1·066	17·868	Below do. (dry year).

The average yearly rainfall for Royston is about 24 or 25 inches.

Although Royston is remarkable for the *number of days* on which rain falls, it nevertheless constitutes one of the driest parts of the county, as the following Tables (taken from Mr. G. J. Symons's well-known yearly accounts of British Rainfall) will show:—

Stations.	Authorities.	Height of Rain Gage.			Depth of Rain.			
		Above Ground.		Above Sea-level.	1860.	1861.	1862.	1863.
		ft.	in.	feet.	inches.	inches.	inches.	inches.
Hertfordshire:—								
Watford . . .	R. Littleboy, Esq. .	5	6	200?	35·00	20·19	26·79	Mr. Symons's Report for the year 1863 is not yet published.
Watford House .	R. Clutterbuck, Esq.	1	6	..	..	..	27·52	
Eastbury, Watford	. .	0	3	..	..	..	27·30	
Field's Weir, Hoddesdon . .	N. Beardmore, Esq.	2	0	82	..	21·98	25·72	
Gorhambury . .	Mr Bogue . . .	2	9	..	34·08	22 13	29·16	
Hemelhempstead .	J. Dickinson and Co.	3	0	250	34·22	21·20	27·44	
Berkhampstead .	W. Squire, Esq. .	1	6	370	36·24	24·10	29·50	
Hitchin . . .	W. Lucas, Esq. . .	2	0	..	..	..	22·52	
Royston . . .	H. Wortham, Esq. .	0	7	267	29·56	19·81	23·93	

The South-midland Counties (including Hertfordshire), the Eastern Counties, and Middlesex, are the driest counties in England.

Soil and General Aspect.

If we except two patches of green sand with a little gault on the borders of Bucks and Cambridgeshire, the chalk formation occupies the whole of the county to the north of a line drawn from a point just north of Bishop's Stortford, through Ware, Hatfield, St. Albans, and Rickmansworth.

A stranger, however, on observing the chalk cropping out in the deep lanes and cuttings might easily be misled as to the general quality of the soil; but the prevalence of the bare fallow and the absence of the tinkling sheep-bell ought soon to undeceive him. The land here is chiefly arable.

The remaining portion of the county south of the chalk formation, and bordering on Essex and Middlesex, consists of London and plastic clay. Here the clays and loam are generally of greater depth, and better suited for pasture. The Middlesex corner of the county is almost entirely devoted to grass-farming, and the making of hay for the London market. In this district he staple of the land is occasionally deep and fertile, as in the nurseries at Sawbridgeworth, where the fruit-trees have under hem 10 feet of good loam.

The richest tract in the county is said to be the sandy loam in the valley of the Lea, from Hoddesdon to Cheshunt. This spo pecially appropriated to market-gardening and to nurseries.

Some of the worst land is in several parishes east and south ast of Stevenage, where the clay is of a poor, wet, hungry de ption, which cannot easily be improved.

round Hatfield, Myms, and Northam, is a considerable tract arked in Arthur Young's map of the soils "poor gravel." That

inent writer himself occupied a farm in the parish of North ÿms, and describes it in these graphic words: "I know not ıat epithet to give this soil; sterility falls short of the idea— ıungry, vitriolic gravel. I occupied for nine years the jaws a wolf. A nabob's fortune would sink in the attempt to raise ιd crops in such a country."

It is remarkable that the hedges and timber are thrifty, and .ow no sign of "sterility." This is owing to the subsoil being ıol, and favourable to their growth. The real sterility—for ıis character is still retained—is partly owing to the mechanical ındition of the surface-soil, a mixture of sticky clay with the :avel, which, cementing together, scarcely suffer the water to ıss into the chalk rock below. Though, after being drained, ıe land dries more rapidly, even then its mechanical texture is ıt sufficiently altered to admit of treading by sheep in winter. Chalking is practised here with great advantage.

As a whole, the county is heavily wooded. On some estates a reat improvement has been effected by removing superfluous nces; but the land, especially when heavy, is often encumbered ith trees to an extent quite incompatible with good farming.

The strip of thin chalk land crossing the northern part of the ıunty, with its wide open fields and turnip and sheep farming, so suggestive of Cambridgeshire that the boundary of the ıunties at Royston may well be passed without being remarked. he natural division is found in the hills near Therfield, on the :eat north road, when you plunge at once into Hertfordshire 'oper, with its woods, small enclosures and heavily-timbered nces.

We desire to give an accurate account of the usual system of rming without needlessly dwelling on defects; and this is not ı easy task. In general, on every variety of soil, good and bad anagement are blended together with such slight shades of ifference that a picture of their general aspect could hardly : drawn, and if drawn would be unreadable. It is easy, how- 'er, as well as agreeable to find for description examples of ilful management, such as alone are worthy of being copied.

Management of Light Land.

The greatest extent of light land is to be found in the southern ılf of the county. The situation of the district within twenty- ve miles of London greatly influences the farming, and parti- ılarly the stock-keeping, since much of the produce, such as ots, wheat-straw, and clover-hay—which elsewhere are made ıto manure at home—are here sold with greater advantage. till, good examples of the skilful fattening of cattle in yards

may be found even here. As the land is unfit for permanent pasture, and the clovers are sold for hay, but few sheep or stock of any kind are kept in the summer. In winter the fattening of early lambs has long been practised; some home-bred tegs or store-sheep, bought in the autumn, are also sold fat in spring.

The common *rotation of crops* is—1. Roots; 2. Barley; 3. Clover (or mixed grasses); 4. Wheat; often followed by, 5. Oats. Sainfoin, laid down for three years, is common.

The *Fallow-Crop.*—A few tares are grown for horses, followed by white turnips for the ewes and lambs; trifolium has been tried, but it is not liked as sheep-feed, and as hay is coarse and unsuited for the London market. Rye for spring-feed is occasionally grown; but this and other stubble-crops are generally disapproved, as interfering with the necessary tillage and with the main fallow-crop. Mangold is grown to a small extent, and is invaluable for the ewes and lambs in April and May. Swedes are the main fallow-crop. Their cultivation in Herts was considered by Arthur Young to be in an advanced state, owing to the command of manure: artificial manures have now neutralised this advantage. Three ploughings are usually given, commencing with 6-inch or 7-inch furrow in autumn, by three horses, on wide lands. In spring the furrow is turned back, and the scarifier used as often as may be necessary. The field is then set out in ridges. 27-inch bouts are the most convenient width for the dung-cart. A good marker is made by removing from Garrett's horse-hoe the beam which carries the hoes, and substituting one with the marking-shares at the required width. About 10 tons of dung per acre are laid in the furrows, which, when the land is in good order, are made and closed up with the double-breasted plough; 2 cwts. of superphosphate are drilled with the seed. When artificial manure only is used the rows are 24 inches apart, and about 4 cwts. of superphosphate are used. This is the usual system; when higher farming is practised, 1½ cwt. or 2 cwts. of guano in addition are sown in the ridges.

Repeated horse-hoeings are given. The cost of hand-hoeing is 6*s*. 9*d*. per acre: viz. chopping out the young plant, 2*s*. 6*d*.; singling by women and children a week after, 1*s*. 3*d*.; after-cleaning, 3*s*. That part of the crop which will not be used before Christmas is partially heaped and earthed in the field ... *s*. per acre, topping and tailing included. An old-fashioned practice, not abandoned though inferior to the last, is drawing out a trench or furrow, every 4 yards, with two deep bouts of the plough, *placing* the swedes, with their leaves and roots on, side by side in the furrow, and then ploughing back the earth on them. The root and top are thus kept alive, and the bulb in great ... protected from alternations of frost and thaw. In mi...

winters it answers very well, but in a long severe frost the frozen roots are for a time unfit for use and after the thaw are much injured in quality.

Mr. Thomas Smith, of Sandridge, has made a good fallow on dry land with his steam-cultivator by the following simple operations. The stubble-ground, smashed twice after harvest, was left till spring, and then harrowed and scarified by horses to draw out the weeds; steam-cultivated again in May, and then ridged-up by horses and dunged. The swedes were a pretty good crop, and better than if moisture had been lost by frequent ploughings. Autumn cultivation has its advocates, but among its opponents are many able farmers who prefer to keep the plough steadily going, turning a good furrow after harvest, instead of merely scratching the surface. Smashing with the steam-cultivator is a different matter.

Barley.—Well-folded land is drilled as soon after the first week in January as it is in good working order, with a view to checking the exuberant growth of straw. March is the principal seed month, and much corn is put in later after the ewes and lambs; the middle of April should be the latest date. May sown barley is sure to be inferior in quality and yield. To avoid this, swedes are either finished earlier or carted to the fallows or clovers, and mangold are heaped in convenient situations to succeed the swedes. After the fold a rather shallow furrow is given. In dry weather in March the drill may follow close after the plough, with or without a scarifying, and generally with two harrowings before and two after the drill, besides rolling. Chevalier and long-eared Nottingham are the sorts most in favour; 2½ bushels to 3½ bushels of seed per acre.

Destruction of Charlock.—Charlock is here a troublesome weed: hoeing and weeding are the usual, but incomplete, remedy. It is far better and cheaper in the end to take two successive green crops and employ the interval in alternately sprouting and destroying the store of seed in the soil. Weedings are expensive and injurious both to corn-crops and to the clover or grass seeds. (The best crop for the second year's fallow is mangold.) It should succeed the latest-fed swedes, after one ploughing, with a dressing of 2 cwts. of guano and 2 cwts. of superphosphate per acre. If it be drilled a yard apart, and the plough used between the rows all the summer, immense quantities of charlock-seed will vegetate and be destroyed, and a bulky crop of mangold is almost ensured. Wheat or barley follows, and will require a light dressing of guano. The acreage under corn is thus for a time reduced, but ample compensation will be found in the value of the mangold crop, in the greater yield of corn per acre when the land is thoroughly prepared, and in the abatement of an

abiding nuisance. By this and similar methods we have seen a farm entirely cleaned of this weed where it was once as "natural" as on other lands still summer-clad in the brightest yellow.

Clover, Sainfoin, &c.—Red clover or cow-grass is not a safe crop oftener than once in eight or ten years; 12 lbs. of seed are mixed with 6 lbs. of trefoil and sown with the hand-barrow; a seed-barrel fitted to a corn-drill saves 3 or 4 lbs. of seed per acre. Alsike is seldom grown alone; for admixture it may be recommended as producing a heavy hay-crop. Stock do not much like it in the green state and it yields no after-crop; but it will grow vigorously on "clover-sick" land, and if required to stand two years will yield as bulky a crop the second year as the first. The usual mixture of seeds is, of white clover 5 or 6 lbs., and of trefoil 15 lbs. per acre, mown for hay and afterwards fed by stock-sheep. Red clover is mown twice, if the second crop is worth it. The hay is made on the swath to preserve the leaf; it is turned 6 or 7 days after cutting, and cocking is avoided unless the weather is fickle. The average crop is 1½ loads for the first crop, and ¾ or 1 load per acre the second crop.

Sainfoin.—4 bushels per acre of seed are drilled in spring-corn, 7 inches apart. It is ploughed up, after three years, with a deep furrow for oats, or occasionally for wheat. The objections to a longer layer are the increased cost of cleaning the land and the risk of wireworm in the next crop. Manure is seldom given. The common sainfoin is preferred for general cultivation; the giant variety is the best to lay down for one year only. The first crop is heavy, though coarse for hay; and the after-crop, stalky and inferior as feed or hay, is usually saved for seed, and yields an average of 2 quarters per acre. It is easy to thrash, and is worth about 40*s.* per quarter. The common sainfoin comes rather later for hay, and, as the first year's crop is not a full one, 8 lbs. of trefoil are sown with it to supply the deficiency. The after-crop, which is too late and short for hay makes beautiful feed. The sheep should be removed by Michaelmas, to allow the plant to make some aftergrowth; if close cropped, it would rot off at the crown in winter. Common sainfoin, if saved for seed, must be fed until the beginning of June like red clover, but here the hay is the most paying crop.

Wheat is drilled 7 or 8 inches apart in the row. The lea is ploughed, when sufficiently wetted by rain, with a 5-inch furrow, and is sometimes pressed by the common "presser," or consolidated by using the Cambridge or Crosskill Roll. A stale furrow is preferred for the seed. The usual seeding on the chalk soils is large, 8 to 12 pecks per acre. Forty or fifty bushels of soot, costing 7*d.* per bushel, is a very [illegible] when no dung is used; it is sown at a

of 2*s.* 6*d.* and a quart of beer for a hundred bushels. Soot ıid to bring on the wheat gradually up to harvest, guano to ɜ and keep it green and growing too long. Soot is, however, liable to adulteration with sawdust charred by copperas with ground cinders, &c., and the growth it induces under ɜ circumstances is much more *gradual* than is desirable! › cwts. of guano sown at seed-time, or in January or February ·ad of April, is found to be a better and safer manure. ɜat is rolled or clod-crushed in spring to set the young plant make it tiller. It is not hoed unless the land is foul, but sometimes harrowed to destroy annual weeds. Red varieties he safest, though after favourable seasons white wheats come ɜ into favour. Mixed white and red seed is liked, and sells ily. On light chalk and gravel land red Lammas wheat is ·med for its soft fine straw, suited for plaiting. The straw rawn by hand from the sheaf in the barn, and after the ears : been cut off it is sold to the villagers at 1*d.* or 1½*d.* a lb., ·times realizing nearly as much per acre as the corn. Twenty- t bushels of wheat is considered an average crop.

its.—The wheat-stubble is ploughed, with a furrow of 7 ɜs by 3 horses soon after Christmas : the land, if ploughed er, is liable to get overrun with grasses. Black Tartarian are drilled as early as February, and the red or early grey as late as the 1st of April. Canadian oats are unproductive pt on very rich land. Scarifying previous to drilling is seldom ed: neither dung nor artificial manure is generally applied, gh no crop yields a more certain return for outlay in guano oats; 2½ cwts. per acre applied at the time of sowing Tar- n oats frequently doubles the produce. Such a bulky crop he collateral advantage of keeping under charlock and other ls. Many intelligent farmers consider that the manage- : of the fifth crop, opposed as it is to the sound principle of ing the land in improving condition, is the weakest point in farming of this county. "To have the last crop of your se the best" is a homely maxim, full of meaning. The e system of management should have this aim in view; for ·ost of restoring condition to land is always greater than that ɜeping it in good heart. The crop of oats after wheat with- dressing seldom exceeds 5 quarters per acre; with liberal ing 7 to 9 quarters are as easily obtained. Winter oats are n to some extent to relieve the spring work and to extend period of harvest; 3 to 3½ bushels per acre are sown from niddle of September to early in October.

Fattening Lambs for the London Market.

On a stock-farm of 300 acres about 200 Hampshire ewes are bought in July or August. They are kept on stubbles and layers as long as the feed lasts, and are then removed to the turnips. White turnips are considered best for milk at the first stage; but later, when the lambs begin to eat, swedes are preferred, as being sounder and better food both for them and the ewes. Hay-chaff is always given before lambing. Lambing commences in the middle of December, and should be over by the middle of January. The lambs fall in a fold, and, if strong, are removed with their mothers to the turnip-fields in a few days. As soon as the lambs begin to eat they are supplied with cut swedes, oil-cake, beans, and cut-clover chaff, *ad libitum*. Oats, maize, and white or partridge peas are partially used. The ewes are also supplied with an unlimited quantity of similar food, oil-cake being preferred. The object is to sell them as soon after the swedes are finished as possible, since clover and summer forage are too valuable for hay to be spared for them. As soon as the lamb is of an age to eat freely, the ewe begins to thrive fast, and with such liberal treatment is fat by the middle of May. The best plan for late feeding is to remove the swedes or mangold to the stubbles and clovers.

The horned Dorsets, which are sometimes kept, drop their lambs a month earlier than others. A few of them are sometimes mixed with a Down flock, under the impression that they incite them to earlier breeding. They are more prolific than other breeds, and their lambs are larger, but only make the same price per head as the Downs: 5 stones of 8 lbs. is a fair average weight for the latter, and nearly 7 stones for the Dorsets.

Of late years 34*s.* to 35*s.* per head has been the average pri[illegible] of well-managed flocks, the first sales of the best lambs reachi[illegible] 40*s.* The lambs were formerly all sent to market in one-hor[illegible] carts, and are still frequently so conveyed. The sales commen[illegible] at twelve weeks old. The Oxford Down ram has been tri[illegible] lately, and also the Shropshire, but Southdown rams are p[illegible]erred; close-coated lambs fatting faster, and selling more free[illegible] The essentials in a good ram for this branch of breeding are, [illegible] and heavy carcase, good quarters, and short wool.

Management of Heavy Land.

[illegible] extent of heavy land is found in the north [illegible] and south of the Hitchin and Royston ch[illegible]

[illegible] half is the heaviest and purest c[illegible]

ten free from stones (which is not elsewhere the case), and ast intermixed with spots of light land.

There are a few large farms, but the average is under 300 cres. The woods are a feature of this district: the farms generally are too much burdened with hedges and timber, and the ields too small.

The usual rotation is:—

	Or,
1. Fallow, or roots.	1. Fallow, or roots.
2. Barley, or sometimes wheat.	2. Wheat or barley.
3. Clover.	3. Clover, or beans.
4. Wheat.	4. Wheat.
5. Oats.	

The latter is most common on the Essex side of the county, where bean-cultivation is most in favour. Of late years the growth of winter-beans has increased considerably, and restricted the five-field course, an advantageous change in most instances, as it admits of better tillage, and the more frequent use of the hoe.

Stock-keeping and the growth of roots have here occupied quite a secondary place.

Two opposite methods have of late been adopted for improving on the common system: the increase of returns from corn, by more efficient tillage, and the use of artificial manures; or else the growth of roots and rape for early folding, or for feeding in yards, or on the clovers in early spring. Without here discussing the merits of the two systems we may observe that the root-cultivation which some heavy-land farmers have successfully practised is never remunerative unless accompanied by a thorough knowledge of the art of stock-feeding.

The high price of stock has led to a pretty general increase in the root-crops, of which a few acres are now grown on most farms (though not usually under very liberal management), to help the making of straw into manure. Store-cattle are then wintered in the yards, or they are fatted off on cut roots, oil-cake, and sometimes meal, cotton-cake mixed with straw-chaff. Hay is more frequently sold than used at home. Pigs are bred and fattened to a small extent.

Farm-horses are generally bought out of Lincolnshire and elsewhere. Twenty years ago it was common to buy in young horses of 2½ or 3 years old from the midland counties, keep them at half work, and sell them at five years old, well fed up, to the London draymen. But this trade has entirely died out, the constant care and favour which the colt requires being incompatible with the requirements of such tillage-farms.

Though neither the breeding nor the fattening of sheep is carried out to a large extent, most of the better farms have a flock of ewes, generally Hants Downs. The Coltswold tup is most in favour; Leicesters and Lincolns are also used. The ewes are folded on turnips, with some dry food, such as malt-combs, with straw-chaff, or trefoil "stover;" (*i. e.* the straw after thrashing the seed).

The lambs are dropped between the middle of January and the middle of February. After lambing, the best managers give the ewes a little oil-cake or a few oats; neither beans nor cotton-cake are liked for suckling-ewes. Most farmers now grow some mangold, to be given to the ewes with dry food on the young clovers. Lambs are weaned early in July, and are well kept on the mixed clovers and on sainfoin, wintered on roots, and sold fat after being shorn. 'They get cake or corn early in autumn, or sometimes from weaning time. The half-bred lamb will, with such treatment, weigh 10 to 11 stones at 15 months old, and will sell for 60*s.*, paying 1*s.* a week from birth. Such early feeding with corn should, however, never be commenced unless it can be steadily maintained, with a due admixture of green and dry food. The value of the purchased food is sacrificed by any check.

The ewes are usually fattened; and this is generally desirable, because an old Hampshire crone, which cost from 40*s.* to 44*s.*, is worth when poor after shearing only 25*s.* to 28*s.*' If fattened after weaning-time, they are put on the freshest after-crop of clover and sainfoin, with a pint of beans daily, or 1 lb. of cake, and finished off on rape or early turnips. Of late years, the high price of old ewes and the danger of bringing the foot-complaint into the farm has led to the purchase of younger sheep, which are kept several years.

The half-bred ewe lambs are sometimes drafted into the ewe flock, and are either coupled with a long-woolled ram, or a west county Down. The excellent constitution and general good character of the half-bred ewe is an inducement to adopt this practice, which, however, requires caution. A lamb, mongrel to the third generation, must have been bred under the auspices of a very skilful breeder if he be not a worse animal than one of the first cross. Such stock often make bold-looking, well-sized lambs; but in the spring they prove more scanty in their proportions, longer in the leg, and lighter both in wool and carcass than better bred tegs.

Fallow Crops.—The tillage here given differs from that of the [illegible]at lands by two additional cross ploughings in spring, and the use of the broad share on a stale furrow, just before drilling, which [illegible] from the middle of May to the middle of June.

he stubble after the fifth crop is not unfrequently, though not ssarily, in a foul state, and filled with the imperishable seeds harlock, the weed of the district. To destroy this pest the cannot be moved too often, provided the crop of seeds ght to the surface has time to vegetate.

utumn cultivation, by broad-sharing the stubble, is prac- to some extent in fine seasons.

vedes are sown on lands ploughed 12 feet wide, so as to be ed by a bout with the Suffolk drill. The use of superphos- e is universal for turnips: guano is added to the other ma- s under liberal farming.

me white turnips have of late years been sown and d early, and followed by wheat. Hand-hoeing is let at 7s. re, to include singling and weeding. The intervals are kept by the horse-hoe, which is often improvised by detaching nould-board from a common plough, and adding a broad- behind.

n the heaviest land, swedes, if grown at all, are drawn to the s; and one of the largest sheep-farmers assures us he has compelled to abandon folding later than November, even ell-drained heavy land, to avoid injury to his barley. The ht of swedes per acre on these soils, and in this dry climate, ery small. Some informants estimate the crop at 10 tons cre; but with average management and seasons it is pro- r less. With the best treatment 18 tons of cleaned swedes cre can be looked for only in a favourable year.

ie cultivation of mangold has increased in the last seven , but has received a check by two or three unfavourable ns. The system of autumn-manuring and *cultivation* in g, without turning in the well-weathered surface, has been luced with unquestioned benefit: two ploughings in autumn winter are advisable to break up the land, which then s better in spring. The breadth grown is restricted by a al impression that they exhaust the land. Is it not meant is that they yield a heavy crop compared with swedes, and fore leave less for the succeeding crop? On highly-farmed on the contrary, mangold is considered a good preparation orn.*

llows are still made with five or six ploughings; and adjoin- Essex, the one-yard ridges are common. This system is described in detail by Mr. Raynbird, in the 8th vol. of ournal, Part 2. On land well drained the ridge is not so prevalent as formerly. Foul land is perhaps more

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long as I carted off the leaves I found a difficulty in growing corn after ld, even with the aid of artificial manures: a good dressing of tops, ploughed oves this difficulty even on light land.—P.H.F.

easily cleaned by a summer fallow on the ridge than by any other process of horse-tillage.

In the same locality clod-burning in summer is practised. About 20 to 25 bushels are burned in heaps about 4 rods apart. The ashes are spread and ploughed in with a shallow furrow. The cost is 2*l.* per acre. The scourings of ditches, and parings of banks and hedges are also burnt and applied to fallows, 30 or 40 loads per acre. Fallows not so treated receive either a light coat of dung, applied at a leisure time, before harvest; or about 2 cwt. of guano, or 5 cwt. of malt dust per acre, at the time of sowing the barley; or 1½ cwt. of nitrate of soda in May. The land is technically said to be "worn out" previous to the fallow, and to require renovating by some of these methods.

Barley.—3 to 3½ bushels per acre are drilled as soon as the land is in fit condition. The drill is preceded by the scarifier; or if the land is free from deep-rooted weeds, by harrows only. Ploughing the fallows in spring, which was formerly thought essential to good farming, is now avoided: the success of the crop depends on keeping the weathered surface at the top and in effecting all the spring operations in dry weather. If heavy rain falls on the fresh furrow, or even at the time of sowing, before the land has become dry and coated, a hard surface-crust will be formed which seals up the young plant. Barley after mangold, with about 2 cwt. of guano, is preferred to late sown wheat, and yields a good quality. Hoeing is not common. Guano for barley is occasionally sown on the fallow in autumn. An early application of ammoniacal manure is always beneficial in preventing the over-luxuriance of straw; but the best practice is to harrow it in in February, or early in March.

Clover, Sainfoin, Trefoil for Seed, Beans.—The two former are grown for hay, with the same management as elsewhere detailed.

Winter beans are increasing in favour as a substitute for clover, and, under good management, are a convenient and profitable crop. The main points are, never to grow them on land out of condition; to put them in, by drill or dibble, as early as the first week of October, and to keep the land perfectly clean by hand and horse hoeing. One ploughing at harvest, or even broad-sharing only, leaves the land in good order for wheat. The deeper the staple of the soil the better for them. Dung is always applied to them, unless it had been given to the previous crop of barley. The rest of the dung is applied to roots, where they are grown; or otherwise to the fallow for barley and to the clover leas. Trefoil is grown alone, and saved for seed. A dressing of dung or soot, or guano, is always applied after it; and the wheat is [illegible] worse for the seed crop if the land was in good heart.

Five quarters of seed per acre is a good crop. It is sold at 24*s.* or 25*s.* a quarter to factors, and prepared by them for market.

Wheat.—The most common varieties are golden drop, Bowles' prolific, Spalding; on the borders of Essex and on the colder heavier lands, Rivett, a bearded wheat (seed about 2½ bushels per acre); rough chaff white is sometimes sown: time of sowing, the second week in October to the second week in November; width of row 6 inches to 8 inches: not much hoeing: a large number of acres dressed with about 40 bushels of soot per acre.

Oats are frequently grown after wheat, as elsewhere detailed.

Chalking.

This ancient practice (for it has prevailed as far back as the history of the county extends) appears to rest its merits almost entirely on its mechanical effect on the soil, to which, however, can hardly be attributed the disappearance of may-weed and sorrel from lands that have been chalked. The common remark is, that the dung-cart should follow the chalking, which is usually applied to a fallow for roots. On the other hand, the occasional complaint of injury by chalking also rests on the mechanical effect—as, for instance, in the case of wheat, when a frost, acting on a heavy coat of chalk, has loosened the surface, and either lifted the plant or caused it to be root-fallen; or in the case of roots, when the process has been deferred till the season is too far advanced for the land to be got into good condition for turnips. The mechanical effect consists in rendering heavy land more mellow and easy to plough, and gravels less liable to burn. On either description of soil chalking is still a general and approved practice. The work is done by chalk-drawers, who charge 5½*d.* per load of 20 bushels, and 1*s.* a load for stones, supposing the shaft not to exceed 12 feet in depth; this price includes spreading (worth ½*d.* per load) and filling in the shaft. One man at the bottom of the shaft raises the chalk and fills the bucket, another winds it up, and two or three, with barrows, drive it away so as to cover 4 to 6 acres, laying it in rows and in bushel-heaps to facilitate the account. The shaft is then filled in, the top soil being in the first instance thrown back and then replaced after the hole has been filled up with subsoil. Early winter is the proper season for the work, and the barrowing is most easily done on unploughed land. Chalk, like burnt earth, should be kept near the surface; it is well therefore to give a shallow furrow in early spring, and a deeper one afterwards. The usual dressing is, from 50 up to 70 loads per acre; the benefit extends over many years, so that the same occupier seldom chalks the same field twice; and his grandson may very

possibly feel that benefit, even in a county where yearly holdings are the custom! Half the quantity mentioned is sometimes preferred, as lessening the first outlay, and lasting the average duration of a tenancy.

The Thin Chalk (Hill) District.

This is a narrow strip passing through the northern part of the county, from Royston through Sandon, Baldock, and Hitchin to Stopsley, in Bedfordshire. The only circumstance which connects the farming of this small and exceptional tract with that of the rest of Hertfordshire is the traffic in farm produce with London, aided by the Hitchin to Royston railway. Town manure is delivered on the route at 7*s.* 6*d.* per ton, and has been used to much advantage on the farms near the stations. Wheat-straw is sent to London; not much hay is made, the clovers and sainfoin being in request for sheep-feed. The common four-course rotation prevails. Sheep are the manure-carriers. The turnip-crop is grown by artificial manures alone, the dung being reserved almost entirely for the wheat-crop, and applied to the clover leas soon after harvest, when it may be seen like a coat of thatch, scorched by the sun and apparently wasted; yet the plan has long been sanctioned by the leading farmers of a first-rate agricultural district, who find that it conduces to a sound crop of wheat. This practice, as well as early ploughing, which suits the wheat plant, expedites the labour of the farm; and on clean land, where the skim-coulter will work, there is no occasion to plough the leas more than once. The benefit of an early furrow may always be noticed in a field where the work has been begun and interrupted; on the earlier ploughed strips the wheat-plant looks greener through the winter, and at harvest the straw is brighter, and the grain more yielding. The system of stock-feeding rules the cropping of the fallows; yard-feeding is quite subordinate to the sheep-fold. On most farms a mixed breeding and fatting flock is kept. The usual plan is to buy in every year Hants or West County Down ewes, which are put to a Cotswold or other long-woolled ram, and fattened; the lambs are weaned in June and sold, or occasionally the ewe lambs are drafted into the flock. As the land is not warm and early enough for stubble green crops, the main dependence for food is on the turnip-crop. A few tares are grown for horses, and a few [illegible] for spring use.

The Hay Farms.

The hay farms, which occupy a considerable area in Middlesex, occasionally extend over the border, as at Barnet, and from

Pinner to Bushey, on the edge of the London clay basin. The boundary line of this formation is everywhere defined by the verge of the grass, which terminates with the out-crop of the chalk. It may be clearly seen from the London and North-Western Railway before reaching Watford; and the division is the more marked at this spot because the diluvial deposits covering the chalk are gravelly loams unsuited to pasture.

The whole farm is usually mown every season. Well-rotted dung is applied between November and the end of January, at the rate of 10 to 15 tons per acre every second or third year. The average crop is estimated at 1 to 1½ loads of hay.

Villa residences, occupied by families from London, have largely encroached on these grass farms.

The rent, said to be 40*s.* to 50*s.* per acre, is higher than such poor heavy clay would yield under arable culture, and at the present price of corn, there is no inducement to break up any portion of the grass. A hay farm is, however, in many respects undesirable, and less productive than it might be. There is but one crop, and that a precarious one; the aftermath is fed at a disadvantage if stock has to be bought at that particular season, and resold as soon as the feed is off. Moreover, the extra labourers required for the hay season can only be tempted by high wages to come from a distance. Such farms are most advantageously occupied by London cow-keepers, or by men who eke out their income by other employment. Their winter occupation is chiefly carting hay to market, and bringing back dung.

The Trade in Farm Produce with London.

Hay and straw are sent to London from all but the most remote parts of the country, and most Hertfordshire farmers are occasional sellers of both. Neither the marketing nor the carting is usually done by the grower, who disposes of his produce to local dealers, and the carting is done by men who make this their especial business. Hay is seldom sent by rail, as it arrives in market in better condition when taken direct in the one-horse cart; and even straw is largely sent by the road. The cost of carriage for a distance of 20 to 25 miles is 12*s.* per load of hay (36 trusses of 56 lbs.), and 8*s.* per load of straw (36 trusses of 36 lbs.). A one-horse load is 18 cwt. Under the impulse given by any rise in price, these bulky articles may frequently be met on the road thirty miles or more from London. The carters start in the afternoon in time to reach the market on the following morning; and, after delivering their load to the salesman, they collect their return load of manure or soot, and com-

mence their journey so as to reach home at night. A return freight of soot (about 80 bushels to the one-horse load) is worth to the carter from 10*s.* to 12*s.* When soot, or a freight of greater value, cannot be procured, dung is collected from the different stables at a cost of about 1*s.* per load. At the farm it is considered worth from 7*s.* to 7*s.* 6*d.* The manure frees the carter from all tolls.

We extract the following clause from an Herts' Agreement, showing the usual obligation of the tenant who sells hay and straw:—"Clover, hay, and wheat-straw may be sold off upon returning, in the same year, a waggon-load of dung or other manure of equal value for every load of hay or straw sold or taken off."

This privilege, which is merely the liberty to sell in the dearest market, is liable to abuse by those who improvidently dispose of that which is their own stock-in-trade, as well as their landlords' safeguard. Such men, however, even when bound by restrictions, to "spend and consume," &c., upon the farm, always manage by some inevitable process to reduce their farms to the lowest ebb of producing power. In intelligent hands this traffic has in many instances permanently raised the condition of the land, and occasionally, in situations favourable for railway transit, has altered the general aspect of the neighbourhood. The occupiers of some such farms have been enabled to double their produce, and more than double their gross receipts. So much more profitable may be the marketing of produce and the purchase of manure than making meat and manure at home.

On some few estates, situated near a railway, the tenant is allowed to sell roots if he bring back 1 ton of London dung for every ton of roots sold off.

Mr. John Ransome, of Wheathampstead, formerly the able manager of Mr. Lawes's farm at Rothamsted, has placed at our disposal the following details. His farm, lying close to the station, contains about 445 acres, including 25 acres of pasture. The greater part of the arable is strong clay, and not adapted for feeding roots on the land. Upwards of 1000 tons of dung made by 200 omnibus horses, eating about 3000 qrs. of corn, are brought on to the farm in a year. If we deduct one-third of this for waste the effect is practically the same as if 2000 qrs. of corn, besides hay, were used in feeding stock on this farm. Mr. Ransome uses in addition about 400*l.* worth of guano, superphosphate, and wheat-manure. This liberal treatment is rapidly raising the condition of the farm, which had been much reduced. Bare fallow has been hitherto necessary to clean the land, but roots will shortly form an important item in the sales. Mangolds are this year sent to the London dairies at 21*s.* per ton

delivered at King's Cross station; cost of carriage 4*s.* per ton. The price would, in consequence of the partial failure of the turnip-crop, have been higher but for the large supply of potatoes. The only stock required to be kept is a sufficient number of cows to tread down the barley and oat-straw. The produce in milk is sent by rail to London.

On calculation, it was found that the first idea of establishing a dairy on a more extended scale, and sending the milk to London, would prove less profitable than the system just detailed.*

The usual price paid in London for dung is 2½*d.* per horse per week at the stable, if within a mile of the station—equal to about 3*s.* 6*d.* per ton on the rail. The buyer carts the dung; the railway charge brings the cost to about 6*s.* 6*d.* per ton delivered to the station, at a distance of 25 miles from London. 2*d.* per ton is deducted for the carriage of quantities of 500 tons in a year, and 3*d.* per ton for 1000 tons. The manure from omnibus-stables is frequently spread at once on the land; that from livery-stables, where more litter is used, must either be carted on heaps or spread in the yard.

There are several dairies in the neighbourhood of Hatfield, where many cows are kept for the purpose of supplying the London market with milk, which is conveyed in tin cans by railway night and morning. The buyers are principally wholesale dealers; but smaller quantities are bought by retailers. The price varies from 1*s.* 3*d.* to 1*s.* 5*d.* per barn-gallon of 17 pints, the buyer paying carriage. The cost from Hatfield to London (17¼ miles) is 6*d.* per can, containing 9 gallons or less imperial measure.

Mr. Lawes's Farm at Rothamsted.

The readers of the elaborate papers in which the results of the Rothamsted experiments are recorded can have no adequate conception of the exact and laborious system by which those results are obtained.

The experimental farm and laboratories are conducted on a scale that gives them rather more the character of a public institution than that of a private undertaking. About 50 acres of arable land and 6 acres of pasture are devoted entirely to the purpose of successive experiments on various crops. The results of these investigations find a sufficient record in the series of able and exhaustive papers published in this Journal. We will, therefore,

* Mr. Ransome contracts for the manure made by 72 omnibus-horses in one establishment, where the daily provender is as follows:—3 qrs. of oats; 4½ bushels of beans; 13 trusses of clover-hay; ¼ load, or 9 trusses of straw for litter (36 lbs. per truss).

ROTHAMSTED FARM.—June, 1863.

SUMMARY STATEMENT OF THE PRESENT AND PREVIOUS CROPPING,

Name of Field.	Acres.	Cropping and Manuring. 1850.	1851.
Barn	28	Turnips, Dung—Artificial.	Whea Unmanu
Thirty Acres	30	Mangolds, Dung—Artificial.	Wheat Unmanu
Upper Harpenden	14	Wheat, Artificial.	Barley Artifici
Harpenden	22	Wheat, Artificial.	Barley Artifici
Little Hoos	9	Wheat, Artificial.	Clover Unmanu
Fosters'	18	Clover, Unmanured.	Wheat Folded
Knott Wood	30	Clover, Unmanured.	Wheat Unmanu
Little Knott Wood	14	Wheat, Folded.	Barley Artifici
Sawpit	14	Wheat, Folded.	Tares, Dung.
Rick-Yard	8	Mangolds, Dung—Artificial.	Wheat Unmanu
Six Acres	6	Turnips, Artificial.	Wheat Unmanu
Clay-Croft	5	Turnips, Dung—Artificial.	Wheat Unmanu
Apple Tree	18	Clover, Unmanured.	Wheat Folded
Ten Acres	10	Tares, Dung.	Wheat Unmanu
Park Field	10	Mangolds, Dung—Artificial.	Wheat Unmanu
Agdell	9	Clover, Unmanured.	Wheat Artificia

* The cropping, as given in the Summary, is for 247 acres of arable only—t having been only recently increased to its present size.

† Eight acres of Barn-Field (now Barley) were devoted to the successive growth of with artificial manures from 1843 to 1852 inclusive, the tops and roots being always c the land, and the last two crops (1851 and 1852) being grown with mineral manu Barley has been grown each year since, the present being the third crop without

ROTHAMSTED FARM.—June, 1863.

Land not under Experiment.—(14 Years, 1850-63, inclusive.)

Cropping and Manuring.

	1853.	1854.	1855.
l.	Oats, Artificial.	Wheat, Artificial.	Oats,† Artificial.
l.	Trefoil, Unmanured.	Wheat, Folded.	Mangolds & Swedes, Dung—Artificial.
ls, ificial.	Wheat, Unmanured.	Wheat, Artificial.	Wheat, Artificial.
red.	Swedes, Dung—Artificial.	Barley, Unmanured.	Wheat, Artificial.
l.	Barley, Artificial.	Mangolds & Turnips, Dung—Artificial.	Wheat, Unmanured.
al.	Fallow & Turnips, Artificial.	Wheat & Barley, Artificial.	Trefoil, Unmanured.
s, ial.	Barley, Folded.	Trefoil, Unmanured.	Wheat, Artificial.
l, red.	Wheat, Folded.	Barley, Unmanured.	Beans, Dung.
t, ired.	Barley, Artificial.	Swedes, Dung—Artificial.	Wheat, Unmanured.
y, ial.	Clover, Unmanured.	Wheat, Folded.	Tares, Dung.
r, l	Oats, Artificial.	Wheat, Artificial.	Swedes, Artificial.
ial.	Oats, Artificial.	Beans, Dung.	Wheat, Unmanured.
r, ial.	Turnips. Dung—Artificial.	Barley, Unmanured.	Wheat, Artificial.
ps, ial.	Barley, Folded.	Clover, Unmanured.	Wheat, Folded.
l, ured.	Wheat, Folded.	Turnips, Artificial.	Barley, Unmanured.
g.	Barley, Unmanured.	Beans, Dung.	Wheat,‡ Unmanured.

portion round the outside which is manured with 1 cwt. of Nitrate of Soda), the to grow a Corn crop until the organic manures of the different Plots are equally

Again under the Rotation of Turnips—Barley—Clover (or Beans or Fallow)— various Experimental manures applied for the Turnips. The present is the last course of the above Rotation.

IMARY STATEMENT OF THE PRESENT AND PREVIOUS CROPPING, &c.—*con*

Name of Field.	Acres.	Cropping and Manuring. 1856.	1857.	18
.. ..	20	Turnips, Artificial.	Wheat, Artificial.	Oa Artif
Y ACRES	30	Oats, Artificial.	Red Clover (peren.), Unmanured.	Wh aft Sheep-F
HARPENDEN	14	Turnips, Artificial.	Barley, after Sheep-Folding.	Be Du
NDEN	22	Red Clover, (peren.), Unmanured.	Wheat, Artificial.	Oa Artif
HOOS	9	Oats, Artificial.	Turnips, Artificial.	Wh aft Sheep-F
RS'	18	Wheat, Artificial.	Barley, Artificial.	Swe Artif
WOOD	30	Oats, Artificial.	Swedes, Dung & Artificial.	Bar aft Sheep-F
E KNOTT WOOD ..	14	Wheat, Artificial.	Oats, Artificial.	Swe Dun Arti
T	14	Red Clover (peren.), Unmanured.	Wheat, Artificial.	Oa Artif
YARD	8	Oats, Artificial.	Mangolds, Dung & Artificial.	Wh Unma
CRES	6	Barley, after Sheep-Folding.	Trefoil, Unmanured.	Wh aft Sheep-F
CROFT	5	Oats, Artificial.	Beans, Dung.	Wh Arti
TREE	18	Swedes, Dung & Artificial.	Oats, after Sheep-Folding.	Red C (per Unma
ACRES	10	Barley, Artificial.	Tares, Dung.	Oa Unma
FIELD	10	Wheat, Artificial.	Red Clover (bien.), Unmanured.	Wh af Sheep-
LL	9	Barley, Artificial.	Tares, Dung.	Oa Unma

STATEMENT OF THE PRESENT AND PREVIOUS CROPPING, &c.—*continued.*

	Cropping and Manuring.			
	1860.	1861.	1862.	1863.
ver), red.	Wheat, after Sheep-Folding.	Swedes, Dung & Artificial.	Oats, Artificial (2 cwts. Guano).	Red Clover (peren.), Unmanured.
al.	Swedes, Dung & Artificial.	Oats, after Sheep-Folding.	Red Clover (peren.), Unmanured.	Wheat, Sheep-Folded (2 cwts. Guano).
.t, ial.	Barley, Artificial.	Swedes, Dung & Artificial.	Oats, after Sheep-Folding.	Red Clover. Unmanured.
s, & ial.	Oats, after Sheep-Folding.	Red Clover (peren.), Unmanured.	Wheat, Artificial (2 cwts. Guano).	Oats, Artificial (3 cwts. Guano).
, ial.	Mangolds, Dung & Artificial.	Oats, Unmanured.	Barley, Artificial (2 cwts. Guano, 1 cwt. superphos.).	Barley (3 cwts. Guano, 1 cwt. superphos.).
y, r olding.	Red Clover (peren.), Unmanured.	Wheat, Artificial.	Oats, Artificial (3 cwts. Guano).	Barley (5½ cwts. Manure).
lover n.), nured.	Wheat, Artificial.	Oats, Artificial.	Swedes, Dung & Artificial.	Oats, Sheep-Folded.
ts, er 'olding.	Red Clover (peren.), Unmanured.	Wheat, after Sheep-Folding.	Oats, Artificial (3 cwts. Guano).	Swedes, Dung & Artificial.
olds, ig & icial.	Oats, Unmanured.	White Clover, Unmanured.	Wheat, Artificial (2 cwts. Guano).	Tares & Oats, Sheep-Folded (2 cwts. Guano).
its, icial.	Tares, Dung.	Oats, Unmanured.	Mangolds, Dung & Artificial.	Wheat, Unmanured.
rley, ticial.	Beans, Dung.	Wheat, Unmanured.	Oats, Artificial (3 cwts. Guano).	Mangolds, Dung & Artificial.
its, ficial.	Red Clover (peren.), Unmanured.	Wheat, Artificial.	Beans, Dung & Fallow.	Wheat, Dung.
ieat, ficial.	Oats, Artificial.	Mangolds, Dung & Artificial.	Wheat, Unmanured.	Laid down in Grass-Seeds.
res, ing.	Oats, Artificial.	Red Clover (peren.), Unmanured.	Wheat, after Sheep-Folding.	Oats (3 cwts. Guano).
eat, ficial.	Oats, Artificial.	Red Clover (peren.), Unmanured.	Wheat, Artificial (2 cwts. Guano).	Oats (3 cwts. Guano).
ley, ficial.	Garden-ground.	Oats, Unmanured.	Tares, Dung.	Barley, Sheep-Folded.

therefore, confine our attention to a survey of the system of management adopted on this demesne farm of a Hertfordshire landowner who possesses in an eminent degree the practical qualities requisite to make such an undertaking successful.

The Home Farm consists of about 450 acres, including 94 of park. The soil is a strong loam on a clay subsoil resting on chalk at a depth of about 12 feet, and sufficiently dry without artificial drainage. Chalking has been here practised by the method already described.

One or two fields were drained, with the idea that they might be sufficiently altered in texture to admit of their being folded by sheep in winter without injury to the land. The result, however, only confirmed Mr. Lawes in the opinion that on such strong soils barley after winter folding is an unsafe crop, owing to the mechanical condition of the land, which is not corrected even by the frost.

"Barley," to quote Mr. Lawes, "will generally succeed better on this land after wheat than after roots, provided it receives a proper application of artificial manure." The artificial manures for corn-crops are sown and harrowed in with the seed, and top-dressings are avoided as far as possible.

So wide an interest is felt in this well-known farm that a detailed summary of its cropping may be of service. (See pp. 286-9.)

NUMBER of ACRES in various CROPS in each of the 14 Years.

Years.	Wheat.	Barley.	Oats.	Beans.	Roots and Tares.	Clover and Grasses.	Total Acres.
1850	73	..	..	..	97	75	245
1851	172	50	..	..	14	9	245
1852	23	108	5	..	63	46	245
1853	38	72	39	..	58	38	245
1854	95	63	..	14	33	40	245
1855	131	10	28	14	44	18	245
1856	42	25	82	..	52	36	237*
1857	56	32	32	5	66	46	237
1858	68	30	75	14	32	18	237
1859	42	33	66	..	46	50	237
1860	50	14	74	6	56	37	237
1861	43	..	86	..	52	56	237
1862	74	9	72	5	47	30	237
1863	43	36	72	..	34	52	237
	950	482	631	58	694	551	3366

The following is a Summary of the Number of Acres in Corn, in Beans, and in Green Crops in each of the 14 years:—

* Eight acres appropriated in 1856 to experimental purposes.

SUMMARY OF CROPPING.

Date.	Corn Crops.	Beans.	Green Crops.	Total.
1850	73	..	172	245
1851	222	..	23	..
1852	136	..	109	..
1853	149	..	96	..
1854	158	14	73	..
1855	169	14	62	..
1856	149	..	88	237
1857	120	5	112	..
1858	173	14	50	..
1859	141	..	96	..
1860	138	6	93	..
1861	129	..	108	..
1862	155	5	77	..
1863	151	..	86	..
	2063	58	1245	3366 Acres.

The average yearly acreage of each crop has been:—Corn, $147\frac{5}{14}$; beans, $4\frac{1}{7}$; green crops, $88\frac{13}{14}$.

An excess of horse-power is necessarily kept for occasional work connected with the estate and the experimental lands, giving a reserve force which can be concentrated on the farm when needed. Without this reserve, or that of steam, the above system of cropping would not be practicable. The fallows for roots are broken up in the autumn, with three or four horses, to a depth of 9 or 10 inches; ploughed back in spring, then twice across, and *bouted* in 27-inch ridges. Swedes get 12 tons of dung per acre, and mangold about 25 tons of dung; of which, part is applied in autumn, and the remainder in spring. 2 cwts. of guano are sown on the dung, and 2 cwts. of superphosphate drilled with the seed. Mangolds are drilled the last week in April, Swedes the first week in June. They are horse-hoed, and cultivated in the usual way in all respects. The crop of Swedes averages 15 tons; of mangolds, 30 tons per acre. Both are commonly drawn off the land. Salt has on this land proved even injurious as a manure for mangold. We saw a field just previous to storing (1863) where a trial of different weights of salt has been given at rates varying from 5 to 10 cwts. per acre, and in every instance the leaves looked yellow and the roots were smaller than when the salt was omitted, and the injurious effect was greater in proportion to the quantity of salt given. Wheat usually follows the roots after a 5-inch furrow, 2 bushels of seed per acre. Browick and Rostock (red varieties) are drilled in 9-inch rows from the first week in October till the end; average crop, 35 bushels per acre.

Chevalier barley usually follows wheat, or other corn, and proves of better quality than when grown after roots. The land is ploughed once with a 6-inch furrow, usually in December, and 2¼ bushels of seed per acre are drilled, in 7-inch rows, in February or March; 2 cwts. of guano and 1 cwt. of superphosphate is the usual dressing. The crop averages 6 quarters per acre.

Tartarian oats are drilled after corn, 7 inches apart, with once ploughing; 4 bushels of seed per acre, 2 cwts. of guano, and about 1 cwt. of sulphate of ammonia. Red and Canadian oats are drilled after roots; 3 to 4 bushels of seed per acre, with 2 cwts. of guano. The Tartarian are sown in February, and the average crop is 10 quarters per acre. The red oats average 8 to 10 quarters; and the Canadian, which are the last sown, 6 to 9 quarters.

All the corn-crops are rolled in spring; they are kept clean without hoeing.

A good deal of straw is used for the estate and to thatch the little stacks on the experimental plots; some is sold.

A flock of 200 Southdown ewes is kept on the grass-land, on clover with mangold, and during the winter is brought into well-littered yards for the night. The details of management are the same as on any other well-managed heavy-land farms.

At present there is no indication of diminution in the productive power of the land. Corn undoubtedly bears frequent repetition on the same land better than roots, even if they be folded on the ground. Of this we saw a marked instance near Rothamsted. By grubbing up a fence some ill-farmed land, which had not been in roots for many years, was added to one of the fields cropped with turnips in the usual rotation. The whole field, similarly treated as to manure and tillage, was sown with swedes, and these, though healthy throughout, were more vigorous in growth and proved a heavier crop on the new land.

The practical lesson taught by this branch of Rothamsted farming is, that on strong land corn crops are more profitable than green crops; and that they may be repeated on such land for a series of years, without the usual intervention of fallow crops, with no apparent decrease in the productive power of the land. To carry out this system two conditions are essential,—a reserve of mechanical power on the farm, and a proper use of artificial manures. Mr. Lawes has endorsed his opinion and practice by letting a farm of 400 acres for 21 years without restrictions as to cropping.

One instance of a farm in which, by the aid of steam-cultivation, great and rapid improvements have been effected, deserves some exceptional notice. In the autumn of 1861, Mr. John

Prout, of London, bought about 450 acres of good heavy land near Sawbridgeworth, and proceeded with great spirit—making it an example of the improvement that may be effected in a short time with the aid of steam-cultivation — to clear away hedges, drain the land, fill up ditches, construct roads, and form reservoirs to feed the engine.

A considerable quantity of the draining was done by one of the steam mole-ploughs of Mr. Edington of Chelmsford. The depth was 28 inches and width 14 feet, and the contract 35*s.* per acre, exclusive of digging and piping the main drains, which cost 5*s.* per acre. Owing to the wretched condition of the land it was thought advisable, instead of growing wheat on the outgoing tenant's fallows, to give them a second year's fallow. This was done by repeated ploughing and cultivating with a 14 horse-power engine, including ploughing and subsoiling to a depth of 14 inches. About 100 acres of Rivett wheat were sown without dressing, and, as might be expected after the two years' fallow and with the remarkably productive harvest of 1863, the crop was very heavy, reaching 8 quarters an acre on some portions that at the present date have been thrashed. The crop on well-farmed lands, of this description of wheat, was, in some instances, equally heavy; the extraordinary season, in fact, levelled the distinctions of management. In future years we do not doubt that the benefit of thorough tillage with liberal farming will become even more apparent in the average quantity of corn that the farm will produce.

The Home Farm of the Earl of Essex is remarkable for an extensive experiment on sewage brought from the adjoining town of Watford. The pipes were laid down eight years ago. The population from which the sewage is derived is about 4500; this does not include the whole parish. Pipes are laid under 96 acres of land, comprising 35 acres of permanent pasture, 7 to 10 acres of Italian rye-grass, and the rest arable. The soil of the neighbourhood is chiefly dry and gravelly, though this particular spot is rather less light than the average. The pumps are worked by a 12 horse-power fixed engine, and throw daily 60,000 to 70,000 gallons, which if applied to one acre of land would moisten it to a depth of 3 inches. In practice, the whole of the sewage is applied during the winter to the 35 acres of permanent pasture, and early in March it is turned on to the rye-grass, and is confined entirely to that crop as long as it continues in growth. Cutting commences when the rye-grass is 1 foot high, which, in 1863, was on the 11th of April; and, as fast as the land is cleared, it is again irrigated daily, receiving a greater or less quantity, according to the quantity of ground cleared. Five cuttings are obtained, and the crop of the year varies from 30 to

50 tons of green fodder. Growth is much assisted by cloudy and showery weather, and is checked by a dry scorching season. The quantity of stock maintained is 18 or 20 horses and 15 beasts; they eat the rye-grass with avidity, and the oxen need no other food while it lasts. They are fattened off on swedes, chaff, and 2 lbs. of linseed-meal, or 6 lbs. of oilcake. A lot of Welsh cattle, bought in the autumn of 1862 at 6*l.* 6*s.*, which had the run of the Park in the winter, were fed on sewage-grass from April till the autumn, and then received the mixture of roots and cake as stated above, realised, at Christmas 1863, the average price of 20*l.* 10*s.*

At the Home Farm the urine from 30 shorthorned cows is collected in a tank, diluted with water pumped from the river, and directed over 4 acres of Italian rye-grass. The cows graze over 30 acres of pasture during the night in summer, and are fed in yards on the rye-grass during the heat of the day; and this 34 acres of land suffice for their maintenance, without other food, until autumn. The total acreage of the Farm (exclusive of the Park) is 231 acres of arable and 120 acres of grass; the whole of the grass, except the 30 acres, is mown every year for hay. The winter stock consists of 120 head of cattle in the yards, and a flock of 250 pure Southdown ewes and their progeny. The arable land is well and highly farmed, without much regard to rotation. About one-third of the land is in roots, and a good crop of these is, on this light, gravelly soil, considered essential to good after-crops. Two covered homesteads were erected on this farm three years ago, on an excellent plan combining economy, convenience, and comfort for a large herd of cattle.

We give the following detailed account of the farming of Richard Oakley, Esq., of Lawrence End, as an example of what may be done on heavy land by summer feeding and early folding.

The corn crops on this farm are very heavy: 10 quarters of oats per acre after wheat are often grown in a locality where half that quantity is the general average. We believe Mr. Oakley finds, under his system of high-feeding, that the barley crop is getting too strong for quality. He will probably have to crop a little faster with corn.

Mr. Oakley writes—

"I have in my own occupation about 1200 acres, about 1000 acres of which are arable, chiefly a heavy loam; the rest, grass of a poor, weak kind; but with liberal supplies of cake or corn I manage to fatten some well-bred, moderate-sized Herefords, which greatly improves the grass.

"My principal crops are wheat and barley: but I sow some 30 or 40 acres of black Tartarian oats, top-dressed, after clover-lea wheat. I do not sow red clover oftener than once in 8 or 10 years, substituting trefoil to be fed off with sheep on cake or corn; the land ploughed up early in summer and sown with

pe (dressed with superphosphate), which is fed off by sheep with cake or rn in September or October, and sown with wheat. I sow 20 or 30 acres of inter tares on some of the strongest land for the horses, pigs, &c.; and, when hey are off, the land is cultivated and laid up in ridges for mangold in the following spring. This enables us to get the mangold in early, whatever the weather may be. In April I begin to put in some early turnips, with 3 cwts. of Lawes's manure, on some of the wheat-stubbles on the strongest land, sowing about 3 acres every fortnight. I do not risk sowing many acres together so early; for, although mildew seldom affects them, they become *pithy* if they are not eaten at the proper time. We generally begin them early in August. Some few acres are sown with spring tares, for fear that keep for the lambs may run short before the turnips are quite ready; these are eaten off with cake or corn, and the land made a tilth for barley.

"I put 300 Hampshire Down ewes to a Cotswold ram. They are now lambing, and the lambs born in February are weaned early in May and put on trefoil, having the first run. Some store-sheep are put behind them to clean up what they leave. The ewes are fattened off every year. The lambs have cake or corn all the summer, and, until they go to market at 11 to 13 months old, shorn. I have already sent 130 to market, which sold from 48*s.* to 53*s.* each; these cut 8 lbs. of wool each. As soon as the ewes have lost their milk they are put on good keep and fattened off, and a fresh lot bought at Overton Fair on the 18th of July.

"Getting rid of my home-bred tegs so early, I am often enabled to buy in others advantageously in the early spring for summer-feeding; 50 of the best of the Down lambs so bought and kept to the age of 21 months, averaged last Christmas 5*l.* 3*s.* 6*d.* each. Mr. Slater, of Kensington, had 24 of them at 5*s.* 8*d.* per stone, which averaged 18 stones 2 lbs. each.

"As to oxen, I put off two lots in the year, one from the grass and the other from the yards. Forty or fifty well-bred polled Scots are bought at Barnet Fair in September, which run on the grass till about 1st of November, when they are put into small, well-sheltered yards, 8 or 10 in each. They begin with 3 or 4 lbs. of cake, and go up to 10 lbs. each. They have clover-hay and wheat-straw chaff cut together; 1 bushel of cut swedes or mangold and half a peck of ground beans are mixed with the chaff. They are sold fat from April to June (according to the beef-trade) to some London butchers. Last year they weighed 115 to 130 stones, and made 5*s.* 4*d.* per stone.

"We put about as many store-pigs in the yard as there are oxen, which live chiefly on what the oxen drop. A polled Scot requires to be in yards 5 or 6 months to make him good, and will then have made manure enough to dress an acre of ground, and this I value at 4*l.* I generally have about 20 young shorthorns sent me from Durham in May: they are about 2 years old, very poor, and cost from 10*l.* 10*s.* to 11*l.* 10*s.* They go behind the Herefords, eat up what they leave, and remain grazing about till Christmas if the weather continues open. They are then shut in yards, have a couple of bushels of cut swedes or mangolds a day and ½ peck of ground beans mixed with wheat-straw chaff until they are turned out for summer grazing, when they have either cake or corn with the grass, and they generally go off about August. Last year they averaged a little more than 108 stones, at 5*s.* per stone.

"I paid last year (in addition to home-grown corn)—

	£	*s.*	*d.*
For cake and corn	1130	6	0
For manures	269	18	0
	£1400	4	0

This was rather less than usual.

"I always endeavour to be beforehand with the work of the farm."

Mr. Oakley also grows early rape in preparation for wheat: 5 lbs. or 6 lbs. of seed are drilled, 14 inches apart, with 3 cwt. of superphosphate per acre. The crop is folded at 8 or 10 weeks old, when about 18 inches high, and while young and luxuriant. At this age the sheep eat it to the ground without waste. Lambs on rape are supplied with clover-hay chaff, even in the hottest weather, and soon eat it freely.

The land is frequently ploughed up after folding, and again sown broadcast and without dressing, and a second crop obtained in time for wheat to follow.

Twenty or thirty acres of beans are grown on this farm by way of change.

Another excellent manager of stock has adopted the following system with profit. He buys cows to calve in January or February; the calves remain with their mothers until both are fat in the following May twelvemonth. They are summered on grass, and the cows get about 5 lbs. of cake daily, or rather less while the grass is at its best. As soon as the calf robs its mother's trough more cake is given, and by November the calves get 3 lbs. of cake each daily, and this is soon increased to 4 lbs. or 5 lbs.; they are wintered on cut roots, cake and meal, and straw-chaff. By May the calves which have remained by their mother's side will weigh about 60 stones, and sometimes more, selling occasionally for 19*l.* at 15 months old.

On farms with good pasture the calves should fall in May; in summer they should be taken into yards with their mothers during the heat of the day, and kept in yards or boxes through the winter and sold to the butcher in June or July. Mangold and lucerne are provided for late spring-feeding. This young beef is not of the best quality, but it is quickly and profitably made. Of course, the calf must be highly fed from birth, and must receive no check. It may be said of this, as of most systems of feeding, "the grazier's eye is worth 4 lb. of cake a day."

The following mixture of food for fattening oxen has been used on a large scale with success.

2 cwts. of meal.	½ sack malt coombs.
1 „ oilcake.	8 sacks chaff.
1 „ pollard.	3 lbs. salt.

The composition of the meal varies with prices; at present it consists of

1 sack of lentils.	1 sack of Indian corn.
1 „ beans.	1 „ oats.

The chaff is one part of good hay, and two parts of the best straw.

The times of feeding, and the quantities for a large ox are—

7 o'clock, 7 lbs. of mixture.
10 „ 1 bushel of roots.
3 „ 7 lbs. of mixture.
5 „ 7 „ of hay for the night.
Two pails of water.

Draining.—Here, as elsewhere, the work of draining has been variously apportioned between landlord and tenant. If the landlord incurs the whole outlay and charges a per centage, a new letting affords the best opportunity for its execution, since the addition of interest to rent is not much relished by occupiers, even for a permanent improvement.

The following examples, taken from the large experience of Mr. Humbert, of Watford, will show how the work is generally executed when the landlord charges a per centage on the outlay. At Haydon Hall, near Bushey, 3 feet 6 inches deep, and 24 feet apart. At Bushey House (a stiff London clay), 3 feet, and 3 feet six inches, by 24 feet and 30 feet. At Hadham Park, near Stortford, and land adjoining, 4 feet by 24 feet and 30 feet. At Walkern, near Stevenage, 4 feet by 30 feet and 40 feet apart. The land in the last instance is a diluvial clay, with water-worn chalk stones, boulders, and a great mixture of soils; advantage is therefore taken of a comparatively open subsoil to increase the intervals and diminish the outlay. When the tenant does the whole the drains are commonly made 30 inches deep, and 5½ to 7 yards apart.

Some diluvial clays lying on the chalk, open in texture to a depth of 20 inches to 28 inches, and resting on a tough clay subsoil impervious to water, are converted into excellent barley lands by draining them 24 inches or 30 inches deep, and one rod apart. The advocates of this system maintain that by placing the outlet no deeper than the meeting between the close subsoil and the more porous surface soil, the land is most effectually freed from superfluous water. Shallow drainage, chiefly by bushes and straw, is an ancient practice on such land, but has been largely supplanted by the mole plough, aided as it now is by the steam engine, which is recommended by its efficiency, economy, and speed in executing a large quantity of work. It has sometimes been maintained by the grass farmers that drainage lessens the quantity of hay, though confessedly it improves its quality and sweetens the pasturage. On the other hand, it would be easy to give instances of grass farmers who have been enabled by drainage only to continue the payment of their rents, and who have themselves suggested this improvement to their landlords, from observing its great benefit on adjoining farms.

Steam Cultivation.—Steam cultivation is of too recent introduction in Hertfordshire for us to draw any broad conclusions from its operation. We saw, however, six or seven instances in which it had been adopted by enterprising tenant farmers.

We are indebted to Mr. John Smyth, of Newsell Bury, for the following communication:—"My farm consists of about 700 acres of arable, of which 540 acres are light land, and about 160 acres are heavy. The latter, a thin skinned clay, is too heavy for roots, and too weak for beans. The whole is farmed mainly on the four-course system, but 40 acres are kept in sainfoin, which stands for four years. I have an eight-horse engine and Smith's tackle; with this, in harvest, or as soon after as possible, I proceed to break up my light land stubble, taking for choice any that may be grassy. After exposure to the sun this is crossed with the larger implement, and then cleansed from rubbish, and finally laid up for the winter in ridges by horse labour. A heavy set of harrows across in the spring, and the use of the broad share will complete the tilth for turnips, which are drilled with superphosphate, dung having been applied to the layers for wheat in July, August, and September. After the foul land has been dealt with, the layers must be broken up for wheat sowing. On my light soil these layers should not be smashed up, because we require the solidity which an unbroken furrow slice affords; early sowing is also desirable. Having reduced my horses from eighteen to fourteen, I determined to add to my steam tackle Howard's three-furrow plough, which makes first-rate work, and enables me to push forward the wheat sowing when the foul stubbles are cleared and rain has mellowed the clover layers. Later in the season I find that the plough makes the best work in preparing the clean light land for roots; it gets over five acres per day, at a depth of six inches. In the following March the furrows are crossed with Smith's large implement, working rather deeper than the plough. In May or June the broad share is used to cut down thistles and annual weeds; harrows, and the Crosskill roller follow, and the turnips are drilled immediately.

"When fallowing heavy land for wheat, if it be foul, I leave it untouched until February or March, when I generally smash it up nine inches deep with Smith's small implement, and leave it lying rough until a favourable opportunity, or until the steam cultivation is finished on the light lands, when, say in the month of May, I cross the work by steam, going down this time to twelve inches. The land lies rough again until the summer rains have softened the clods, when a heavy set of harrows will at once form a tilth. I then apply farmyard manure, cut down thistles by the broad share, and harrow down just before the wheat is drilled. Forty acres of wheat growing on land treated exactly as I have

described are looking strong and well. The land is well drained, and there is not an open furrow in the field, neither is any required. Previous to my entry on this farm (eight years since) this class of land was miserably wet, ploughed four inches deep on small lands, about three yards wide, with water furrows innumerable. The remaining portion of fallow (the clean heavy land) is ploughed by horses, during the months of December, and January and February, at a time when the engine is wanted at the homestead; if it be smashed by steam during the summer a good tilth will be the result.

"A clean wheat stubble intended for a crop of spring corn should be managed thus: Harrow the stubble to cause the seeds to vegetate, plough up by horses immediately after wheat sowing, do nothing more until the drilling in the spring. If the land be light the less you break up and expose it to the atmosphere the better. I have known many instances in which an extra ploughing, or a too deep scarifying has ruined the chance of a crop. Heavy land might be advantageously smashed directly after harvest, and then treated as above. My engine ploughs, cultivates, thrashes, and grinds the corn, cuts chaff, and sifts it, breaks oilcake, splits beans, crushes oats, and, in fact, makes itself generally useful."

Miscellaneous.

Harvest-work is done on several plans; either both cutting and carting are done by the day, or else the cutting is done by the piece, and the carting by the day, the labourer receiving six or eight pints of beer; more commonly the whole business of cutting and carting is let to a gang of men, allotting 10 or 12 acres to each, and paying 10*s*. or 11*s*. an acre. Under each plan a labourer's earnings in harvest amount to 5*l*. 10*s*. or 6*l*. 10*s*.

Though task-work is generally desirable, not only on the score of economy but for its influence on the habits of the labourers, still large gangs of men working together are objectionable. This is especially the case in harvest, when its tendency is to encourage extravagance in beer, and induce young labourers to make slovenly work in order to keep pace with the more practised hands.

Reaping is fast being abandoned; three-fourths or more of the corn is now mown; a large breadth is cut by reaping-machines. Shepherds who have only the care of a flock in winter make a harvest with the other men, and are paid ploughman's wages (12*s*. a week) at lambing-time, with beer as their only perquisite: their day-wages average 10*s*. a week. Near the grass-district double or treble the usual prices are often paid for mowing clover, the demands of the hay-farms causing a scarcity of hands.

The old custom of gift-ploughing prevails in many the county, to help a new tenant on his entry; a circu sent to friends and neighbours to fix the day. One popular in his neighbourhood, on entering his farm ploughs at his gift-ploughing, and more than 100 a ploughed in the day.

On the tenure of land little need be said: yearly prevail, and leases are the exception. Yearly tenanci nable at Michaelmas by a six months' notice, are the r

The incoming tenant has the right to make the fallo notice to quit on the 24th of March is, as regards the f notice to quit the next day. This is an apparent har the outgoing tenant, since it deprives teams which he m tain for harvest and other work, of one portion of the employment. In practice, however, the incoming te it to his interest to employ and pay his predecessor fo the fallow while he, as is proper, has the power of r the manner in which the work is done.

An objectionable system of selling wheat, peas, and the load of 5 bushels prevails; barley and oats are so quarter. At St. Alban's there is an inconvenient p storing in warehouses the bulk of the wheat offered for sample sack in the market; it is consequently sometime back past the seller's door for delivery to the buyer.

The average crop of wheat on heavy land is esti 25 bushels per acre. This, perhaps, is little better tha yet the statement is concurred in by many informants at larger returns. They have not unfrequently add ought, with our system, to average 35 to 40 bushels."

The rents of such land average about 22*s.*; tithe re 5*s.*; and poor's-rate 3*s.* 6*d.* per acre.

Implements.—Iron-ploughs of modern make are comn light land: in the heavy-land district the Rayne-p popular.

The use of carts for harvest-work is so nearly uni this county that a waggon in a harvest-field in Hertfor nearly as great a curiosity as a sedan-chair in the London.

A simple lime-sowing machine for destroying slugs nvented by Mr. Thrale, of No-Man's-Land, and mac Davis, of Hemel Hempstead, is a good deal in use. I of a perforated iron-cylinder, in four compartments, to ime. As these revolve the abrasion causes the lime t n very fine particles. Two bushels of hard, unslack me are used per acre; and 10 acres may be gone over i w' h one horse. A damp, warm night is chosen, when

out. The machine is drawn in the opposite direction to the d, so that the creatures may get a sufficient dose of the caustic. hout this precaution they would escape on their first irritation he dust.

t Courson's farm, I noticed that the mangers in the cattle- l, instead of being fixed, were swung by chains or ropes he nearest beam; a simple plan, which saves the expense of ts, and facilitates the raising or lowering of the mangers.

everal parishes in the north of the county have been only ntly enclosed, viz.: Therfield and Sandon in 1840, and Ash- l, a parish of 4000 acres of good land, as lately as 1862. dock and Clothall remain still unenclosed. This appears nge, since the right of sheep-walks over open fields every d year, by preventing the growth of roots, is ruinous to farm- on light lands, whereas, after enclosure, the produce of land ften doubled.

singular example of farming at Letchworth deserves men- . Fifteen hundred acres of good land, which was allowed to wild to grass twenty-five years ago by the late owner, have intained in the summer months a herd of 400 or 500 oxen of ious breeds, which, in favourable years, have come up in good er for fattening in autumn.

arm-Buildings and Cottages have in isolated cases been much roved, but nothing has been done on an extensive scale. s, therefore, remains a weak point in the agricultural economy he county.

ood brick cottages, on the model of those erected by Lord re on the farm of Mr. Samuel Jonas in Essex, have been built he estate of Mr. Fordham, at Sherfield, and deserve special ce when the subject of cottage-building is under considera- . They are in groups of three, with a common bakehouse, , and pump. Each cottage has three bed-rooms, and two ns below, besides the usual offices. They were built by James Jacklin, of Royston, at a cost of 225*l.* the group, or each, and for neatness of appearance and convenience of ngement are superior to any we have hitherto known to be pleted at such a price.

overed homesteads have been erected by the same builder at hall, with cheap and durable roofs of corrugated iron, a erial almost as light as glass, and therefore requiring very t scantlings for support. Homesteads entirely or nearly red may reasonably be expected to pay interest on the cost heir erection, more especially where straw is valuable, since aving in litter is only surpassed by the greater gain from the rior quality of the dung produced.

provements lately introduced and those still required.—The

numerous examples of good farming already noticed afford satisfactory evidence of improvement: future progress will very much depend on the extent to which they are imitated, and on the increase of the average amount of farm-capital. Among the improvements specially requiring attention by landlords and tenants, the following may be enumerated:—extended cultivation of mangolds and early turnips on heavy land; the use of more artificial and other manures; a reduction of the cost of cultivation by less frequent and more effective tillage; an increased head of live stock, with a more economical system of feeding; better shelter for animals in yards, and less exposure of manure; care in avoiding to sow the seeds of charlock and other weeds; restriction of the growth of oats after wheat to clean land in good heart; and the enlargement of fields by the removal of hedges and timber, accompanied by a better distribution of woods and plantations, so as to secure picturesque effect without the sacrifice of material interests.

The labourer's condition also demands very grave consideration. The efforts made at Rothamsted and in other parts of the county to improve his lot and raise his social condition are entitled equally to praise and imitation.

XIII.—*Agricultural Notes on Hertfordshire.* By Rev. J. Clutterbuck.

Agricultural Literature—Climate—Rainfall and Percolation of Water as tested by Dalton's Gauge—Area and Population — Sales of Fat Stock — Physical Geography—Influence of Swallow-holes on Drainage and Water Supply —The Water-level in the Chalk—Sheep Farm at Wheathampstead—The Chalk district — Irrigation — Paper-Mills — Drainage of low Meadows — Water-Cresses — Cherry-Orchards — Woods — Straw-Plait—Seed Wheat — The Bennington Flock — Heavy Roller with revolving Shafts.

Agricultural Literature.

The agriculture of Herts has already been chronicled by Ellis of Little Gaddesden (quoted by A. Young), in 1732; by Walker in his 'Report prepared for the Board of Agriculture,' in 175[illegible] by Clutterbuck, in his History of this county (1815); but especially by Arthur Young, in his 'Report,' published in 1804.

To that distinguished pioneer in agriculture we are indebted for our only reliable means of contrasting the agriculture of the 18th with that of the 19th century. Of him it has been well said: "If great zeal, indefatigable exertion, and an unsparing expense in making experiments can give a man a claim to the gratitude of agriculturists, Arthur Young deserved it more than

men. We will not assert that in all cases his conclusions sound or his judgment unimpeachable, but even his blun- if he committed any, have tended to the benefit of agricul- y exciting discussion and criticism." *

e above passage aptly characterises his 'Report of Herts,' mainly embodies the opinions of the leading farmers, ur or professional, of that day. Drill husbandry, the culti- of the Swede turnip, the substitution of the Southdown for ong-legged Wiltshire sheep, were then leading subjects scussion; and it is remarkable that the introduction of ved implements and practice rests throughout this Report mateurs, whilst the management of the most common and ial operations of husbandry in the present day will be to be completely at variance with that of some of the best cal farmers who gave information to Arthur Young.

name of Mr. T. Greg, of Coles, near Westmill, often l by A. Young, deserves a passing notice. Prompted by oke's (Lord Leicester's) example, Mr. Greg first undertook, aid of Hill's scarifier, to apply to his own wet tenacious the principles of Norfolk husbandry. He abolished the summer fallow, ploughing but once for a crop, and that n winter, using the scarifier, the drill, and the horse-hoe to complete his operations.

proof that improvements in husbandry were early intro- into Hertfordshire, A. Young, quoting Mr. Rooper, of ampstead, says that clover and turnips were supposed to been introduced by Oliver Cromwell, who "gave a farmer l How a 100*l.* a year on that account," and that there had little change in the course of cropping for one hundred

climate of England, though it may have undergone some es, must be essentially the same as when Fuller said of rdshire, "It is the Garden of England for delight; men only say that such as buy a house in Hertfordshire, pay ars' purchase for the aire thereof;"—a salubrity due to the ical condition of the greater part of the county, gravel chalk.

Rainfall and Percolation of Water.

following tables of rainfall and mean temperature were furnished by those gentlemen by whom the registry has kept. The column Dalton's Gauge, under the head el Hempstead," refers to a rain-gauge, suggested by Dr. and kept at Apsley Mills for twenty-nine years last past,

* *Vide* Kirwin, 'Irish Transactions.'

which only registers that portion of the rainfall which percolates 3 feet of soil. Its construction is described in 'Ree's Cyclopædia' under the head Evaporation. It is calculated that the amount so collected represents the quantity which sinks through the surface soil to the springs, which supply the rivers and give power to the mills.

The average rainfall registered for 29 years is 22·5, percolation 7·5 inches. The Table shows 25·8 of rainfall and 4·9 percolation for the last 10 years. It will be seen that the amount of rainfall increases with the longitude westward.

Berkhamstead.			Hemel Hempstead.		Royston.	
		° ′ ″		° ′ ″		° ′ ″
Longitude W.		0 34 0	Longitude W.	0 27 50	Longitude W.	0 0 2
Latitude		52 45 0	Latitude	52 45 0	Latitude	52 2 40
Height above sea, 370 feet.			Height above sea, 250 feet.		Height above sea, 266 feet.	
Years.	Rain.	Mean Temperature.	Rain.	Dalton's Gauge.	Rain.	Mean Temperature.
1854	24·0	..	18·2	1·4	18·1	49·2
1855	30·5	45·6	25·8	5·4	25·0	46·7
1856	30·0	47·7	26·6	7·4	21·9	48·8
1857	29·2	49·6	28·1	7·4	27·9	50·5
1858	22·5	48·3	20·5	3·2	20·4	48·9
1859	33·0	49·3	32·6	4·5	25·4	50·2
1860	36·2	45·7	34·2	12·1	29·5	46·0
1861	24·1	48·0	22·2	6·4	19·8	48·5
1862	29·5	48·4	27·4	8·0	23·9	48·5
1863	26·7	49·0	22·7	3·3	17·8	49·4
Average	28·5	47·1	25·8	5·9	22·9	48·6

Area and Population.

The geographical extent of the county may be taken to be, in length, south-west to north-east, 36 miles; south-east to north-west, 26 miles; with a circumference of from 130 to 140 miles. Halley is quoted as estimating its superficial area at 451,000 acres. The population returns 1861 give it at 391,141 acres. Clutterbuck gives the population, in 1801, 97,577; 1811, 111,654: increase, 14,077. The last returns, 1851, 167,298; 1861, 173,294: increase, 5996. Total increase since 1801, 75,717. The persons employed chiefly in agriculture in 1801 are 20,611. The families so employed in 1811, 16,998.

Markets and Sales by Auction.

Of the old markets, suffice it to say, that there are 18 market towns in which the old system of selling wheat by the load of 5 bushels is still very generally followed. Barnet fair is still

famous for its supply of neat cattle, brought from Wales and Scotland, &c.

The modern practice of holding sales of fat stock by auction at such towns as Hitchin, Hertford, Bishop's Stortford, and Watford, has assumed such large and increasing proportions that it may be well to trace its development as exhibited in the town of Hitchin. These sales which were here first held occasionally in 1852, took place in 1853 twice or three times in a month, and ultimately, in 1862, every week. A yard specially fitted for the purpose was opened by Messrs. Page and Harding, 8th December, 1862. Their sales in 1861 realised 65,345*l.* 4*s.*; in 1862, 79,496*l.* 5*s.*; in 1863, 107,014*l.* 0*s.* 6*d.* The sale of Christmas last, December 15, realised 5,118*l.* 9*s.*, and consisted of 108 oxen, 675 sheep, 2 calves, and 44 pigs. In the year 1863: 1876 oxen, 22,492 sheep, 123 calves, 2707 pigs, and 1156 lambs were sold.

Physical Geography.

The boundaries of this county are not, as is sometimes the case, determined by the physical features. On the north, the boundary is generally coincident with the escarpment of the chalk or Chiltern range of hills; on the south-east it is formed by the Lea and its affluent the Stort; to the south it lies very much along the high ridge, where the London clay is partially capped by drift of the Eocene beds; and on the west it follows the ridge overhanging the valley of the Bulborne, in which the Grand Junction Canal finds its course. Thus the agriculture of Hertfordshire in some cases takes its character from the several counties by which it is surrounded, and from which it is divided by an ill-defined and arbitrary line. The geological features of this county are comparatively simple. It comprehends within its limits a considerable portion of the north-western limb of the chalk-basin of London. Here nearly the whole substratum is chalk, the surface of which is either covered with drift gravel, or the tertiary deposits of the London and Plastic clay; a very small part consists of the Gault clay, which, with a trace of the upper green sand, crops out from beneath the chalk.

As the physical features of the surface are necessarily ruled by the geological condition, there is a considerable sameness in the outward aspect of the county, though there is a frequent and marked difference in the nature and quality of the soils.

Speaking generally, the county may be divided into the clay and chalk districts; the former forming the southern portion adjoining the county of Middlesex; the latter extending from the outcrop of the clays to the escarpment of the chalk hills, the frontier of the counties of Buckingham, Bedford, and

Cambridge. The rivers Coln and Lea flowing in opposite directions in part of their course, form a sort of natural division between these two districts, though they do not strictly determine the limits on either side.

In the southern district, the London Clay, is mostly marked by low, rounded undulations, broken by tortuous watercourses, which provide the natural escape for surface-water, and a ready outfall for artificial drainage.

SWALLOW-HOLES.

The upper levels are very frequently covered with beds of gravel, which retain a certain quantity of water for the supply of shallow wells, which, as on Bushey Heath, attract a considerable population. The water also finds vent in land-springs at the junction of the gravel with the clay, the feeders of the brooks which run into the rivers Coln and Lea. Occasionally these waters pass, in their course towards the valley, the outcrop of the sand which underlies the clay beds of the Plastic clay formation; it then sinks by swallow or "swilly holes" into the subjacent chalk, and goes directly to augment the springs whence the rivers derive their perennial sources. Very large volumes of water so sink into the earth, and the mischief which would arise from the flooding of these brooks in winter is thus much abated. It has been suggested by very high authority that the perennial supply of water to rivers might be materially augmented if artificial means were used to facilitate the absorption of these waters. Very remarkable instances of this natural drainage may be seen more or less along the outcrop of the sand beds of the Plastic clay formation in the parishes of Bushey and Aldenham. In the watercourse which leads from the reservoir at Elstree, it has been found necessary to stop these swallow-holes to prevent waste.

The construction of artificial swallow-holes deserves our consideration as a means both of maintaining a perennial supply of water to our rivers, and also of facilitating drainage operations or a system suggested more than a century ago by Elkington.

The soil of the upper levels of the clay district marked by the rounded flint-pebbles embedded in the sand is wet and unkindly, not capable of bearing grass of any value, and ungrateful under the most liberal treatment as arable land. This gravel, with its characteristic blue-pebble, is transported in many cases below the higher levels, where the sterility of the soil is in proportion to the thickness of the bed. Wherethe London clay comes to the surface it forms a stubborn soil, which, however, by draining and a liberal treatment is made to grow abundant crops of grass. It also favours the luxuriant growth of oak, elm, and ash timber.

immediately beneath the London, the Plastic clay crops out. e upper or clay-beds of this formation, as the name implies, well suited for the manufacture of kiln-ware; it is more acious, and less manageable than the London clay; and usually ms a narrow band on the slopes and escarpments of the hill-es; the lower beds are of very pure sand, sometimes perfectly ite, suited for domestic, horticultural, and other purposes, ugh some of the beds are interspersed with rolled pebbles. the breaking up of this stratum much of the soil that covers chalk is due, and from hence the hard conglomerate known as rtfordshire pudding-stone is derived. The most fertile spots this district are found at the outcrop of these strata, where clay and sand are amalgamated so as to form a friable and dly soil. The geological condition here described extends re or less in a band across the county from Moor Park, near kmansworth, on the west, to its eastern limit bounded by the r Stort.

'he neighbourhood of Bishops Stortford furnishes a good mple of farming under geological conditions not found else-re in this county, but resembling those which subsist in e parts of Essex. The river Stort runs through a trough in chalk, over which the Plastic clay-formation crops out on the of the valley. Its beds of clay and sand here amalgamate h the flint-gravel, with which the chalk is covered on the er levels, to form a light, friable, and fertile soil, suited to r-course husbandry. On the higher levels the tertiary clay ns rather wide-spread "plateaus," covered very generally h a drift consisting of water-worn chalk, with some chalk-ts. This drift, for such it appears to be, is not found in the stern parts of the clay-districts of Hertfordshire under the e geological conditions of subsoil, though it is very exten-ly diffused in Essex, where it presents some of the best corn-l in that county. It would be very interesting to trace the nt of this deposit in both counties, and, if possible, account its unusual presence as a covering to the tertiary beds resting the chalk.

The Water-level in the Chalk.

As in the case of the clays, the chalk-district may be sub-ided; it has been so treated by Arthur Young, who, in his ps, lays down the principal part as loam, distinguishing as lk only that small space which is drained by rivers running to north with a fall anticlinal to the natural dip of the stratum. opting this division, of which it would be difficult to define exact limits, we find that the southern slope from the thern limits of the county to the point where the river

Coln enters the county of Middlesex, has a total dip of about 350 feet, or from the higher ground in Bedfordshire of 650 feet, which latter point is about 770 feet above the level of the sea. The highest ground on the ridges between the rivers is capped with portions of the plastic clay *in situ*, which may be deemed outlying patches of the clay-district, in some cases covered with gravel to a sufficient depth to retain the water to serve the ordinary wants of villages or hamlets, such as Abbots Langley and Bedmont. Thus the population is found either on the ridge or in the valleys near the rivers, the intermediate parts being dependent on water drawn from deep wells sunk into the chalk.

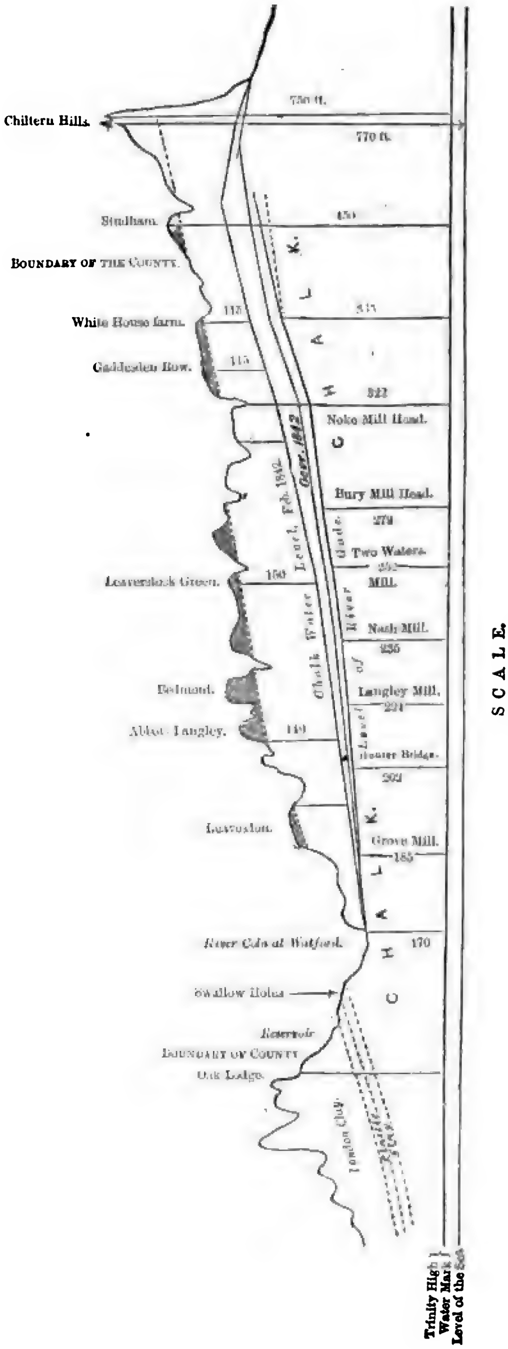
On the accompanying section, taken on the ridge midway between the rivers Gade and Ver, is shown the depth at which water is found, with its noted alternations at two periods in the same year. The level of the course of the river Gade, with which that of the Ver is nearly identical, is also given between these points. The surface of the subterranean water would be shown by an inclined line, fixed at the river, and more or less elevated or depressed towards the ridge according as the stock of water is augmented by the replenishment of the chalk stratum, or reduced by the natural drainage. Thus in chalk districts the level at which water is found may be accurately ascertained.

The intermediate space between the ridges, and the rivers which run in the valleys, is covered with gravel, often presenting a surface which consists almost entirely of flint-stones the removal of which, if it were possible, would rather detract from, than add to the productiveness of the soil by quickening evaporation. This soil with slight variations forms the main staple of the district which lies between the outcrop of the London and Plastic clays and the northern limits of the county.

A stranger acquainted with those Western counties which have a soil almost identical with this in its texture and its geological bearings, is here struck by the absence of breeding flocks, the deficiency of stock, the inadequacy of the farm-buildings, and the small size of the enclosures which here prevail. He would find the land cleared of its sheep after the consumption of the swede and root-crop, the hay and straw very generally sold, and barely replaced by London manure, when it is to be had. Very many exceptions may of course be found, among which a farm at Wheathampstead, near the centre of the district under consideration, is a notable instance.

[illegible]P FARM AT WHEATHAMPSTEAD.

[illegible] of 317 acres, of which 20 are in not very productive [illegible]. Fifty-six acres of the arable are upon the [illegible] higher levels, and the remainder is of a lighter



Chiltern Hills.
770 ft.
Studham.
Boundary of the County.
White House farm.
Gaddesden Row.
Noke Mill Head.
Bury Mill Head.
Two Waters.
Mill.
Leverstock Green.
Nash Mill.
Langley Mill.
Abbot Langley.
Grove Mill.
River Colne at Watford.
Swallow Holes
Reservoir
Boundary of County
Oak Lodge.
London Clay
Chalk Water Level, Feb. 1842
Level of River Gade
Octr. 1842
CHALK.
CHALK.
SCALE.
Trinity High Water Mark
Level of the Sea

character—rather a sharp flint-gravel, somewhat under the average quality of the district. The whole has been more or less chalked from below, according to the custom of this county. The fertility of the farm is maintained, not by selling off the produce and trusting to London and other extraneous sources for an equivalent, but by developing and trusting to its own internal resources. The following list of animals fatted and sold from the farm has been kindly furnished in illustration of the system pursued:—

	1862.	1863.
Lambs	391	392
Sheep	333	356
Beasts	6	5
Calves	45	50
Pigs	205	198
Total head	980	1001

On 317 acres of land.

The system of cropping is four-course, managed with especial reference to sheep-stock. Much reliance is placed on the deep cultivation of the soil, which is principally effected by the use of a two-wheeled plough, divested of its mould-board, which follows the first plough, armed with a share copied from that of the unwieldy and disused old Hertfordshire plough. Besides the usual succession crops of swedes, mangold, mixed layers, tares (to be followed by white turnips), it is the practice here to sow rape between the rows of beans on the heavier portion of the farm.

A certain portion of the ewe flock, which averages 330 head, consists of Dorsets, which are put to a Sussex or half-bred ram; both ewe and lamb are generally fatted for sale, and the stock replenished from fairs.

The Chalk District.

The Northern or chalk district, having a fall anticlinal to the p of the stratum, is drained by streamlets which are the affluents he Cam, the Ouse, and, in one instance, of the Thame.

his remarkable tract of land may be surveyed looking from on, which stands high on a rounded escarpment of the ying Plastic clay.

n descending from the higher ground, the chalk—here geo- lly t ower chalk without flints—is more thinly covered [illegible] very frequently becomes a part of the cultivated [illegible] in the Vales of Aylesbury and White [illegible] scarpments immediately overhanging the [illegible] of these strata

by gentler undulations, which present a breadth of very useful arable land. This district is thus described by Sir Henry Chauncy in the 'Historical Antiquities of Hertfordshire' (1700) He says, "The Vale of Ringtale, or Wringtale, which lies north of the great ledge of hills crossing the northern part of this county (extending from Backway to Offley), where the soil is mixed with white marl, yields the choicest wheat and barley, such as makes the best mault that serves the King's Court or the City of London, which caused Queen Elizabeth often to boast of her Hitchin grape."

It has been noticed that this county comprehends within its boundary a small tract of land to the north of the villages of Ashwell and Caldicot, on the outcrop of the trace of the greensand and of the gault clay which underlies the lower chalk. It is all more or less covered by the drift of the chalk, though in some places the sheer gault lies very near the surface. Though its general features and management resemble those of the tract to the south just described, which rests on the lower chalk, there is this notable difference—that, as it rests on a clay subsoil, it requires thorough drainage. It was here that Mr. Bailey Denton carried out that mixed system of drainage of which there is so full and valuable a record in this Journal under the head of the Hinxworth Drainage.

Irrigation, Miils, and Meadows.

Although the streams which issue from the deep valleys by which the surface of the chalk is furrowed afford to this county abundant supplies of water, agriculturally they have not been turned to much account.

Near Rickmansworth, on the Chess, on the Bean, and at the Hoo, water-meadows indeed may be seen; but frequently the ancient weirs have been superseded by mills, the old water-rights having been either bought up by the millowner or lost by desuetude. The corn-mills themselves have often been diverted to the manufacture of paper, for which purpose machinery was first set up by M. Foudriener, its inventor, on the river Gade.

The Gade, as its traverses this county, has a uniform fall of 14 feet per mile, which offers great natural facilities for irrigation, as well as water-power.

Drainage of Low Meadows.

Perhaps there is nothing in the whole county which more obviously calls for improvement than the so-called water-meadows, or rather marshy swamps, which line the banks of some of the rivers. This is more striking in districts where there is little

natural or available grass-land. The remedy is simple. The mill-dams are impediments to the free action of the landowners, but very generally this difficulty may be overcome. The wetness of the meadows is not, even near the mill-heads, due to soakage from the river, but from stagnation in the soil of water derived from springs on either side of the valleys. As a remedy, first a ditch should be cut as near to the side of the valley and as far from the river as possible. In some cases pipes of large bore might be used; the spring-water should then be led below the outfall provided by the next mill-dam; the cleansing of the ditches, brick-rubbish, or any hard material, should be placed or even piled on the surface of the meadows; then with ordinary attention to keeping up the river-banks and filling up all transverse ditches, much valuable land might be reclaimed from its virtual sterility.

Water-Cresses.

A new rival to the water-meadow has sprung up of late from the artificial culture of water-cresses. Fifty years ago those who sold this plant were content "to strip the brook with mantling cresses spread." One such was Mr. Bradbury, to whom the idea suggested itself that water-cresses might be cultivated to advantage. He obtained permission first to try the experiment in spring-ditches at West Hyde, in the parish of Rickmansworth, just on the borders of Bucks, and satisfied the occupier of the land that the cleansing of the ditches and regulation of the height of the water in them as practised by Mr. Bradbury was beneficial. The ditches were next let at a certain rent and under certain restrictions, and very shortly Bradbury's cultivated water-cresses became a regular article of traffic in the London market. From this small beginning a large trade has sprung up, which now extends to the Manufacturing Districts. The persons who hire the spring-ditches for the cultivation of the plant scour and cleanse them with much care, level their bottoms, and often expand their area till they form a series of shallow lakes, in which the height of the water is regulated by dams. The dams are either permanent—formed of stones or two lines of boards, supported by stakes, between which clay is rammed; or temporary—consisting of moveable boards, bricks, or other materials. These, in some cases, are either placed transversely to the flow of the water, to keep it to its required level in the subdivisions of the beds, or else so arranged that the stream may be conducted under the bank-side, apart from the adjacent bed, as by an irrigation-carrier, to any spot below. Very frequently borings are made in the chalk to facilitate the issue of the clear spring-water in its purity, which is deemed of great

importance to the quality of the crop. The best sorts of cresses are then selected, that most in request is known as the Dutch Brown, from the shade of colour it takes when it has reached maturity. The plants are placed in rows, generally with stones upon them, to prevent their being removed by the flow of the water. All this is done at considerable expense; besides which it is necessary to guard the beds from attacks of birds, especially the blackbird, whose ravages at certain seasons are of a very serious character. By regulating the height of the water in the various divisions a proper succession in the ripening of the crop is secured. The cutting is performed either by wading in waterproof boots between the rows, or by placing moveable planks across the beds. The washing and packing in hampers or baskets finishes the operation. The growth of this simple and indigenous plant is daily on the increase; the letting the ditches for this purpose is more profitable to the landowner than the irrigation of the meadows, if it could be done; the rent cannot be estimated by the acreage under cultivation. Such sums as 40*l.*, 50*l.*, and upwards are often paid by persons who have little capital but their industry, and employ a great proportionate amount of other labour in gaining their living.

Cherry-Orchards.

In the western parts of the county the cherry-orchards occupy so considerable a portion of the soil, and form so great an item in the rural economy, as to demand attention. They are generally found at a high elevation, where there is a considerable depth of loam, clay, or gravel, naturally drained by the chalk beneath. The great age of many of the trees shows that their culture is of ancient date, as also appears from the agricultural histories of Hertfordshire. It does not seem that these orchards have been extended of late years, in spite of the access to the Manufacturing Districts afforded by the introduction of railways. The great drawback to the cultivation is the precarious nature of the crop, which is very often destroyed in a single night by an untimely frost, apart from other casualties to which fruit-crops are liable. The fruit is generally sold on the trees to dealers, and realises from 12*s.* to 16*s.* per "ped" or basket, holding about four dozen pounds. The sorts grown, though not confined to the county, are characteristic of Hertfordshire. These are known as the Caroon, the largest sort, and small Hertfordshire black. Besides the usual uses, they are converted into cherry brandy, and, if report says true, enter very largely into the composition of other liquors, to which they do not give their name. They are also used for the purpose of dyeing.

Woods and Plantations.

Woodlands cover a large part of the surface of this county. The quantity and quality of timber varies considerably in different districts. In the north-western portion, where the chalk is near the surface, beech woods prevail. To the south of this, on a zone running from the south-west to north-east, oak and ash are more abundant, both in the woods and on hedge rows, the oak having generally a stunted appearance; the ash is also of slow growth, but bears a good character for wheeler's stuff. Still further south the elm may be said to be the weed of the country. In the most southern portion, where the chalk is covered by the London and Plastic clays, the elm and oak attain a much larger growth, unless the upper drift gravel intervene, which is only suited to larch or fir. The beech woods, in which underwood refuses to grow, are periodically thinned, and the fall used by wheelers, and, in some cases, by chair-makers, though this trade is almost entirely confined to Buckinghamshire. The ordinary coppice is commonly cut every twelve years and sold by auction. As a general rule, the growth is not sufficiently straight and free to serve a better purpose than making rods or headers for fencing, pea-sticks, faggots, or at best, turner's stuff, or sparred hurdles and wattled hurdles for sheep.

The woodlands are too often objects of little care, and are scarcely ever renewed or replanted as the old stools die or fail. Those which belonged to the late Sir John Sebright, of Beechwood, are, however, an exception to this rule, and bear the traces of careful replenishing to this day; his son and successor follows his example.

In many places woods have of late been grubbed, when, from their frequent interlacing with the arable land, they were incompatible with improved cultivation; but in a county where there are so many resident proprietors, coverts for game will not readily give place to the steam plough.

Straw-Plait.

The manufacture of straw-plait not only furnishes employment for the females of the labouring classes, but bears on the agricultural interests of part of the county, by creating a market for some of the wheat-straw grown within its limits. This trade, from its nature, varies with and is ruled by the fashions in dress. Luton and Dunstable, in Bedfordshire, are its head-quarters, though it extends to the centre of the county of Hertford, where much plait is made to supply the dealers, whose attendance at Hitchin and elsewhere creates a considerable market. The

;rown on the chalk soils at the north of the county is well for the purpose. The straw drawers either purchase the n the bulk, and take away all that suits their purpose, or, ommonly, bargain to take, by weight, that only which they The farmer who has a crop fitted for the purpose has ed with great care, if the weather be fine, in an early of its maturity, leaving the sheaves open for a time till e quite dry, and setting aside those in which the straw e twisted; they are then placed, with care, in the rick r, so as to come out quite straight and uninjured. The who is employed by the dealer to draw the straw takes in quantity from the sheaf and binds it quite tight with iern strap; he then places his parcel, thus formed, behis legs, takes a few straws at a time just beneath the nd draws them out, until his other hand, to which he rs them, is full, and ties the handful, like a gleaner, h the ears. The flag is removed by a coarse iron-toothed the ears are cut off, and it is then handed to a second , who makes up bundles about a foot in diameter, neatly with straw. The straw is then in a marketable state, and to the manufacturer to be sorted, cut into lengths, and so or use. The waste is not so great as might be supposed, chaff and caving is left behind with the ears, and with of the rough straw, which may be converted into manure. peration puts the farmer to some inconvenience, but the ;iven is remunerative, amounting, on an average, to about iy. per pound, so that the value of the straw may exceed the corn.

moral effects of this manufacture are often called in on; the early age at which the children are employed iinders their education by keeping them from the village ; it indisposes and unfits them for domestic service, it retains them at home and hinders their being subjected drudgery of field labour.

Varieties of Wheat.

iough the vale of Ringtale, in the north of the county, a name of old for the Hertfordshire white flour, the land lly is better adapted to the coarser red wheats, and high farmnnot in this respect overule the inherent quality of the soil. Mr. Hainworth, of Hitchin, great credit is due for the on bestowed by him on the selection and improvement of . He is a cultivator of Spalding, Syer's Red, Red Straw , Hopetown White, Red Lammas, and other wheats; and ven his own name to a variety raised by him from a

single ear, which he specially recommends, as bearing the forcing of high farming.

As the fair testing of different sorts of wheat on the same ground is as difficult as it is important, Mr. Hainworth's method is worthy of notice. First he selects a field in which the soil is as near as may be, of an uniform character, measuring, for example, 16 poles wide by 33 poles long; 8 rows of each different sort of wheat are dibbled with great care, the short way of the land, 9 inches apart, and 5 inches between the holes, in each of which three corns are deposited. This is repeated in succession until the whole piece of land is cropped with say 11 beds of each sort. The 8 rows of each variety in each bed are reaped separately, bound and set up, then brought together, threshed and measured, thus giving a fair average of the whole 11 beds, grown in different parts of the same field. The farm on which these experiments are made is necessarily in a high and cleanly state of cultivation; its fertility, in fact, is maintained by the application of London stable manure. If this careful selection, cultivation, and testing of varieties of wheat be looked on merely as a commercial speculation, the results must be valuable; but in this case, as in almost all such, the higher object of advancing the interests of agriculture gives a fresh stimulus to the labour and skill which such experiments at all times require.

Sheep.

After a word of commendation of the Hoo flock of 400 Sussex downs, improved of late by rams from Babraham, and a word of warning as to the ultimate results of cross-breeding between the long and short woolled races, however promising at first, I pass on to speak of that which for not less than two centuries has been called "the far-famed Bennington flock." Bennington is a village near the centre of the county, between Stevenage and Standon. The flock, which is still owned by the descendants of those who first formed it, is said to have sprung originally from the old Wiltshire horned breed, which appears to have formed the staple of the sheep stock in the midland counties of England up to the beginning of the present century. Within the memory of many persons, the horn, one of its distinguishing features, though reduced in size, was still retained, and in all respects the sheep were nearer their original type than at present. Attempts at improvements were at one time made by the introduction of Leicester, Gloucester, or Cotswold rams, though the produce of one, if not both these crosses, was weeded from the flock. Of late years the chief, if not the only new blood, has been Lincoln; some of the flock still retain traces of

the Roman nose, and other traits which render this flock remarkable, both as a record of the past, and a most interesting instance of the successful breeding of long woolled sheep. It is said, and the assertion is borne out by the appearance, great size, and noble character of the flock, that the weight to which the ewes attain when fatted is 20 stone, that a teg has been known to shear 21¾ lb. of wool; and that the average weight of two fleeces is 28 lb., or 1 tod. The flock now unfortunately numbers only 200. The value placed on them for breeding purposes may be learned by the significant fact, that all the ram lambs are saved, and command a ready sale at good prices.

It may be a question whether this breed and quality of sheep is that best fitted to a neighbourhood and soil such as that on which it has been so long and so successfully maintained; the mere fact of its existence, however, supplies an argument in its favour. They are said to do better and to be more hardy than the Lincolns, by which, from time to time, the stock has been replenished, and compared this year favourably with some Lincolns newly imported, which stood beside them in the fold.

Implements.

One novelty among implements is to be found in the adjustment of shafts for the purpose of turning, or rather reversing the action of a heavy iron roller, an unpatented invention of the owner of Beechwood, which weighs 3 tons, and can be loaded by filling a cradle with stones up to 4 tons. The roller is used either on the sward of the park, or to compress the roads; in either case, the difficulty is to turn so heavy an implement with two horses drawing abreast, and necessarily leaning on a shaft. This is avoided by fitting the double shaft to the upper of two hollow discs of woodwork encircling the cylinder, which revolves after the manner of a railway turn-table on that beneath it. For the purpose of turning, two vertical iron pins, by which the discs are fastened together, are drawn, the horses make a half turn, the pins are replaced, and the roller is ready to move in the opposite direction, without the least strain or inconvenience to the team.

XIV.—*Agricultural Notes on the Census of* 1861. By J. D. Dent, M.P.

My dear Sir,—In looking over the Reports of the Census Commissioners for 1861, I have met with certain information connected with Agriculture, which, I think, deserves some permanent record in our Journal; and I shall venture to submit to you, first, some of the Tables which have been prepared by the Commissioners, and then a few remarks of my own upon them.

The first thing which strikes us, in England and Wales, is the aggregation of population in towns—the inhabitants of 781 towns amounting to 10,960,998; and those of the villages and country parishes to 9,105,226. "The area occupied by the 781 towns is 2991 square miles; that of the rest of the country, 55,330 square miles."

During the decennial period from 1851 to 1861 the rate of increase of population has been much greater in town than in country, and the large towns have gained more than the small ones. In 1851, 580 towns were included in the record, and in that year the population of these towns and that of the surrounding country was nearly equal; "but in the subsequent ten years, while the population in the villages and country parishe increased at the rate of 6·5 per cent., the increase in the town was 17·3 per cent., this difference being due to the migratio from country to town."

Unfortunately, for purposes of comparison, the Census Com missioners of 1861 have drawn up their Tables which refer to th occupations of the people, in a somewhat different form fro those of 1851; and there is also a variation between the Scotc and English systems, which renders an exact comparison a matt of difficulty. These changes have arisen from a desire to impa to the returns of each successive census a greater degree accuracy, and to point out more clearly the different occupatio of the people. In 1851, and again in 1861, the farmers of th United Kingdom were requested to return the number of acr which they occupied, and also the number of labourers who they employed. In 1851 we find 91,698 persons, who, in th eturns, called themselves farmers, but had apparently no laboure Many of these probably did all the labour themselves; othe .. l the assistance of their children; some employed laboure nly during a portion of the year; and some may have h abourers whom they did not return. It is certain, however, th n parts of the country, men who have only a few acres of la nd emp' y no workmen, have always been returned as farmer ... his ve must bea in mind when we compare the numb

s and graziers as stated in the Occupation Tables with ›er of farm-holdings returned. There is considerable ;y as to whether the farmers returned all their in-door ants; and while in some cases women and boys were in others they were not. We must also bear in mind ' of the labourers, and also of the farmers who are here are disabled or superannuated; the workman as well ired tradesman or professional man being, by the rule mmissioners, referred to his former calling, even though be an ineffective member.

st Tables which we will extract are VII. and VIII.:—

—Number of Persons engaged in Agriculture in England /ales, enumerated at each of the Censuses of 1851 and 1861.

:upations.	Persons.		Males.		Females.	
	1851.	1861.	1851.	1861.	1851.	1861.
ıltural Order . . .	2,011,447	1,924,110	1,559,762	1,545,667	451,685	378,443
r	30,315	30,766	17,047	15,131	13,268	15,635
. . . .	249,431	249,735	226,515	226,957	22,916	22,778
's Wife	164,618	163,765	..	..	164,618	163,765
Frandson, Brother, &c.	111,704	92,321	111,704	92,321	..	..
ıter, Sister, Niece, &c.	105,147	83,830	..	..	105,147	83,830
. . . .	10,561	15,698	10,561	15,698	..	..
ıbourer (Out-door) .	952,997	958,265	908,678	914,301	44,319	43,964
door)	12,517	25,559	12,517	25,559	..	..
In-door)	288,272	204,962	189,116	158,401	99,156	46,561
Land Agent . .	3,064	4,702	3,064	4,702	..	..
udent	104	490	104	490	..	..
. . . .	30	33	30	33	..	..
ower or Dealer . .	60	35	59	35	1	..
Merchant . . .	85	81	85	81	..	..
ıplement Proprietor	55	236	50	236	5	..
ıgine and Machine	..	1,205	..	1,205	..	..
Service	11	1,761	11	1,761	..	..

nainder of the list of occupations is not so closely con- th agriculture:—

:upations.	Persons.		Males.		Females.	
	1851.	1861.	1851.	1861.	1851.	1861.
r and Farmer . .	16	91	16	91	..	..
d with Agriculture	128	117	116	73	12	44
Wood-gatherer . .	7,772	8,916	7,772	8,907	..	9
d with Arboriculture	236	10	220	10	16	..
. . . .	71,805	78,533	69,685	76,760	2,120	1,773
. . . .	2,383	2,917	2,350	2,838	33	79
wer	39	55	39	55	..	..
d with Horticulture	97	27	23	22	74	5

.—Number of Farmers and Graziers, Farm-Bailiffs, Farm-Servants , Agricultural Labourers, and Shepherds (Out-door), enumerated nsuses of 1851 and 1861 in England and Wales.

1851	1,347,387
1861	1,340,916

In Scotland, the totals of the agricultural class were—

1851	388,203
1861	378,609

These Tables may be found at p. 35 of the 3rd vol. of the 'Census of England and Wales for 1861.'

From Table VII., I think, we may gather that the tendency in England and Wales is not towards a subdivision of land. The class who return themselves as proprietors of land, remains very stationary; and from my own experience, I should say that land is not going into more hands, but that estates are rather increasing in size; and that landed proprietors, as a class, are a wealthier body than they formerly were.

Tables, which I shall shortly quote, will give us the idea that the size of farms is increasing, and that small holdings are being absorbed in the larger; and this is to some extent corroborated by Table VII., in which we find fewer of the farmers' relatives employed upon the farm, and farm-bailiffs considerably increased. The very great diminution of in-door male farm-servants is a further indication of a change in the class of men who now make farming their pursuit; since men of the new stamp feel the inconvenience of boarding in their houses a large number of youths, with whom, a few years ago, the farmer worked during the day, and associated in his leisure time.

But the increase in male out-door labourers and shepherds does not compensate for the decrease in in-door servants, which, exclusive of the farmers' relatives, amounts to 12,050. I am not inclined, from personal experience, to imagine that there has been any decrease in the aggregate of manual labour employed upon farms; on the contrary, the superior cultivation of our crops, and the increased care bestowed upon our flocks and herds, lead to the opposite conclusion. When, therefore, I remember that some few years ago it was no unusual thing in a parish of 600 inhabitants, not far removed from an active manufacturing district, to have ten or a dozen labourers entirely or partially out of work during the winter months, and that now in the same parish we are frequently obliged to supplement our own labourers by Irish, I can only conclude that the redundant agricultural population has been absorbed by manufacturing industry; and that those who remain are more efficient, better paid, and more fully employed than they were 10 years ago. Referring to Table VII., it will be found that three new classes of industry have been called out to assist in agriculture. There are now 236 proprietors of agricultural machines, which, being no doubt let out for hire, are available for the small farmer; and attached to these there are 120[illegible] agricultural machine-workers. Besides these, the land

ıge service forms a new class of 1761 men, who are ipally employed by the companies which lend money ;ricultural improvements.

: find the class of out-door shepherds more than doubled since rising from 12,517 in that year to 25,559 in 1861. This ıse of shepherds does not seem to agree with the conclusion, ich Mr. Thompson arrived in the last number of the Journal, that our sheep-stock had diminished. During the show-at Newcastle I had the opportunity of talking this matter vith Messrs. Torr and Randell, who attributed the increase : shepherd-class to two causes; first, to the increase of sheep, ı each of them, speaking the one of Lincolnshire, the other .oucestershire, believed to have been considerable; and, llу, to the enlarged size of farms. On small holdings, rmer, his son, or his head man looked after the sheep, and ot returned as a shepherd: as farms grow larger, and the on them are increased in number, it becomes the sole duty e or more men to look after the sheep, and this is an-reason why the class returned as shepherds has so largely .sed. The experience of these two gentlemen is so much valuable than my own that I readily quote it, and will y add, that it quite coincides with what I have noticed in vn locality.

another class may, for a moment, claim our attention. In 490 agricultural students are returned as against 104 in —another indication of the new race of farmers, who find it .ble to exercise their brains as well as their muscles in the ɛ of agriculture.

other set of Tables is published which are of some interest as they go, because they profess to give the size of the ıoldings in this country. In 1851, these were worked · the whole country; but in the census of 1861, the abstracts ›n a smaller scale, because the Commissioners had a delusive that such returns might be superseded by a general system ;ricultural Statistics to be carried out for England and on the Irish plan. In this year, therefore, they selected ounty from each of the the ten registration districts into England and Wales is divided, and made the abstracts ose counties only. The counties selected were Bucking-Cambridge, Chester, Cumberland, Lincoln, Norfolk, Shrop-Sussex, Wiltshire, and the North Riding of York.

:re are, however, three Tables of the year 1851 which relate size of holdings generally in Great Britain; and as there › corresponding Tables in the Report of 1861, I will quote here.

: following Table in the Census of 1851 gives the number of of cultivated land in Great Britain; but the hill-pastures of

Scotland, and probably of some parts of England and Wales are not returned as cultivated :—

ACRES of LAND in GREAT BRITAIN, and Acres of Land returned as in the Occupation of the Farmer by whom it is Farmed.

	Number of Farms.	Acres of Territory.	Estimated Number of Acres under Culture as returned by Farmers.	Number of Acres Uncultivated or Unaccounted for.
Great Britain	285,936	57,624,377	29,213,312	28,411,065
England	225,318	37,324,915	24,905,758	12,419,157
Scotland	56,650	20,047,462	4,188,578	15,858,884
Islands in the British Seas	3,968	252,000	118,976	133,024

The following Table represents the average size of farms in Great Britain at the same date :—

Acres.	Number of Farms.			
	Great Britain.	England and Wales.	Scotland.	Islands.
Total	283,378	223,271	56,150	3,957
Under 100	190,573	142,358	44,469	3,746
Between 100 and 200	52,912	45,752	7,009	151
200 and 300	20,603	18,401	2,166	36
300 and 400	9,031	8,061	961	9
400 and 500	4,063	3,585	471	7
500 and 600	2,248	1,971	272	5
600 and 1000	2,816	2,372	442	2
1000 and upwards	1,132	771	360	1

The size of 2558 farms in Great Britain—of 2047 in England and Wales, of 500 in Scotland, and 11 farms in the islands of the British seas—was not stated.

In the same year, the proportional number of farm-holdings of various sizes was given. Out of every thousand farms there were :—

Acres.	Great Britain.	England and Wales.	Scotland.	Islands.
Under 100	672·50	637·60	791·97	946·68
100	186·72	204·92	124·83	38·16
200	72·71	82·42	38·58	9·10
300	31·87	36·10	17·11	2·27
400	14·34	16·06	8·39	1·77
600	9·94	10·62	7·87	·51
1000 and upwards ..	3·99	3·45	6·41	·25

Had similar Tables to the foregoing been prepared for 1861, we might have made a more accurate comparison for the whole

ıd and Wales, than the Tables for the ten selected counties, ch I shall now refer, will enable us to form :—

'ABLE 100, page 144, vol. iii., GENERAL CENSUS REPORT, 1861.

's and Proportions of Farm-Holdings of various Sizes in the Counties cks, Cambridge, Norfolk, Shropshire, Lincoln, Wilts, Sussex, Cheshire, ›erland, and North Riding of Yorkshire, as returned at the Censuses 51 and 1861.

ıf Farm-Holdings in Acres.	Number of Farm-Holdings.		Of every 1000 Farm-Holdings, the proportional number of the size represented in the First Column.	
	1851.	1861.	1851.	1861.
.. .. ..	52,552	46,526	1000·00	1000·00
Under 100	31,583	26,567	600·99	571·00
100	11,035	10,022	209·98	215·41
200	4,869	4,666	92·65	100·29
300	2,153	2,285	40·97	49·11
400	1,060	1,096	20·17	23·56
500	648	640	12·33	13·76
600	881	942	16·76	20·25
00 and upwards	323	308	6·15	6·62

–The above numbers exclude 416 farms in 1851, and 665 in 1861, from o returns of acreage were received.

ɔf the Number of HOLDINGS of LAND in the Ten Counties of Bucks, ridge, Norfolk, Shropshire, Lincoln, Wilts, Sussex, Cheshire, Cum- d, and North Riding of Yorkshire, in 1861 and 1851, with the se or Decrease of such Holdings.*

Size in Acres.	1861.	1851.	Decrease.	Increase.
.. .. 5	1086	1784	698	..
.. .. 5 and 10	2656	3590	934	..
10 and 20	4676	5603	927	..
20 and 30	3434	3967	533	..
30 and 40	2955	3298	343	..
40 and 50	2621	2897	276	..
50 and 75	5609	6344	735	..
75 and 100	3530	4100	570	..
100 and 150	6205	6942	637	..
150 and 200	3817	4093	276	..
200 and 250	2915	3110	195	..
250 and 300	1751	1759	8	..
300 and 400	2285	2153	..	132
400 and 500	1096	1060	..	36
500 and 600	640	648	8	..
600 and 800	645	605	..	40
800 and 1000	297	276	..	21
1000 and 1200	147	157	10	..
1200 and 1500	90	82	..	8
1500 and upwards	71	84	13	..
ı of acreage	665	416	..	249

Table is calculated from two Tables, No. 87, 88, **which may be** found at **vol. iii.,** of the General Census Report of England and Wales, 1861.

This decrease of small holdings agrees very much with the conclusions which we drew from the Tables of the occupation of the people, that slowly, but steadily, the tendency is for large farms to absorb the small ones. Indeed, the change that is coming over modern agriculture will fully account for this. Men wh freely embark their capital in the cultivation of the soil ar anxious to have a wide field for their operations. As the increase production of forage-crops, together with the large purchase c corn and cake for feeding purposes, requires improved building for the accommodation of stock, the landlord perceives that considerable outlay on his part must be necessary; and he nat rally is constrained to have his farms increased and consolidate that this outlay may be remunerative, and as little burdensome a possible.

Even though the decrease of small holdings is proceeding upo rather an extensive scale, if we are to take the ten counties as general index of the state of the country, nevertheless the grea proportion of land in England is still so held.

Referring to Table 100, we find in these counties that 571 ou of every 1000 holdings are under 100 acres; 215·4 are betwee 100 and 200; and 100·29 between 200 and 300; leaving out of every 1000 farms but 113·30 which are 300 acres and upward Whilst I find that, of farms more than 500 acres, there are bu about 31 in every 1000 in Cambridgeshire and Lincolnshire, 4 in Norfolk, 46 in Sussex, 93 in Wiltshire, 14 in Cumberlan 15 in Bucks, and 8 in the North Riding; and in Cheshire an Shropshire they scarcely exist.*

I am not much surprised to find that the farms which va from 50 to 200 acres are being absorbed, because they we generally occupied by men of small capital, who were very mu dependent upon corn crops for their living, and, at the pres prices of grain, such men, not having stock to back them cannot make farming remunerative; but I am rather surprised the very great decrease of holdings of the smaller size, up to acres. The great demand there is for such occupations, merely by the industrious labourer but by the rural tradesm and artisans, would have made me imagine that the decre might not have been so rapid; and I feel inclined to regret that no less than 1632 small holdings under 10 acres ha disappeared, for I should fear it is a sign that fewer agricultu labourers have their paddock and their cow than was the case years ago. In my own neighbourhood I know how eagerly small cow-paddocks are taken, and how valuable is the milk he family and I have seen so much good in many cases as

* These figures are calculated from Tables 89 to 98, pp. 140 to 143, vol. ... the Report

from this addition to a man's position, that I should regret to think it not so easily attained as heretofore. That the number of small holdings is to some extent a test of the labourer's prosperity is, I think, shown by the fact that the proportion of small holdings in Lincolnshire, where labour is high, and also in Cheshire, Cambridgeshire, and Norfolk, varies from 28 per cent. in Cheshire to 19 per cent. in Norfolk; whilst in Wiltshire, Cumberland, and Bucks, the per centage drops to 12, 10, and 8. Now, the last Parliamentary return on agricultural wages in the year 1860 is less complete than it well might be. There is no return, for instance, from Bucks at all. In Cumberland there are returns from three unions, in which employment is described as uncertain, though at particular seasons men make good wages; whilst in Wiltshire from 9*s*. to 10*s*. per week is returned as the average, with 20*s*. to 25*s*. in harvest time; in Cheshire the returns for the agricultural labourer are at 11*s*. to 12*s*. per week; but we must remember that we get many operatives and a much higher paid class in some parts of that county; in Lincolnshire 13*s*. 6*d*. to 15*s*. are the returns; in Cambridgeshire, for only one union, regular work 10*s*. to 12*s*., and 14*s*. to 16*s*. at task-work; and the return from Norfolk is to the same effect.

This survey of our present position suggests the inquiry whether the increase of our towns and of railways may not have had something to do with the changes that are taking place? The 781 towns in England and Wales, which are enumerated in the Census, include an area defined by the municipal or parliamentary boundary, or that of some local or district board, of 2,991 square miles, or nearly two million of acres. Of course this space is not all covered by buildings, but a very large proportion of it is ether used for purposes of building or of recreation, and is not productive of human food. Again, there were at the close of 1860, 7583 miles of railway open in England and Wales, which may be roughly estimated to occupy 83,413 acres of land; and the quantity so occupied is increasing every year.

This brief examination of the Census papers only leads us to regret that there is not more accurate information to be obtained as to our agricultural position. No one doubts that a great increase of energy and capital is now devoted to farming operations, and yet it is impossible to measure the extent of our agricultural progress. Rents are higher, the price of land is higher, and farms are in greater demand than ever; unless, therefore, the increase of our crops and of our stock is considerable, it is not easy to see how farming can be remunerative. But we have no means of testing this. Some persons are of opinion that a good deal of land is being laid down to grass; but I think this un-

certain—I do not myself see many signs of it. We know that in Ireland during the late disastrous years a certain portion of land has gone out of tillage, and between 1862 and 1863 the Bog and Waste *unoccupied* has increased by 74,856 acres, owing to the withdrawal of live stock from the mountain and boggy pastures, consequent on the decrease in Irish cattle, which since 1859 has considerably exceeded the whole of our importations of foreign cattle. But the stock in Great Britain is still an unknown quantity, and the only Returns of the produce of our crops, being those made by the corndealers, are notoriously imperfect. These Returns, which are given to us in the statistical abstracts annually presented to Parliament, by no means lead to the conclusion that any considerable increase has taken place in the growth of wheat or barley, while they point to a decided decrease in oats:—

QUANTITIES of WHEAT, BARLEY, and OATS sold in the principal Market-towns in England and Wales from 1851 to 1863.

Years.	Wheat.	Barley.	Oats.
1851	4,487,041	2,333,710	940,006
1852	4,854,513	2,389,489	947,550
1853	4,560,912	2,474,206	880,408
1854	3,913,257	2,267,997	765,438
1855	5,256,874	2,608,862	816,688
1856	5,046,736	2,678,936	701,159
1857	5,243,940	2,262,733	537,364
1858	5,203,948	2,434,373	482,766
1859	5,498,202	2,410,326	503,256
1860	4,623,257	1,787,056	495,880
1861	4,289,665	2,392,872	624,898
1862	3,588,085	2,281,930	702,957
1863	4,493,471	2,487,660	571,086

Now, if we refer to Mr. Lawes' paper on 'Experiments on the Growth of Wheat for Twenty Years in Succession on the same Land,' published in the last number of the Journal, we shall find the variations in the preceding Table agree very closely with his sketch of the different seasons. The harvest of 1854 was one of the largest in yield for many years past: that of 1855 less abundant than that of 1854, and various in quality; in 1856 the quantity of land under wheat was considerably over the average, the crop was more than an average, but not well got in; in 1857 the extent not so great, but the crop unusually productive; and in 1858 a crop clearly above the average, though not so great as in 1857. We then come to the unfavourable seasons of the last few years; and on the whole this return does not indicate that our production of corn is increasing to any very appreciable extent. Mr. Thompson, in his very able paper in the last Journal, holds

ther a different opinion as to our production of corn; but with spect to our stock, he comes to the somewhat startling con-usion that sheep have actually diminished in number; a dimi-ation which the Irish returns unfortunately confirm, both as to attle and sheep, as far as that country is concerned.

The existence of these doubts, and the consciousness that great hanges in agriculture are in silent operation, of which we cannot leasure the extent, tend to make us desire trustworthy, and herefore systematic, information on such questions as we have ere suggested, which are of so much interest alike to the con-umer and producer.

XV.—*The Management of a Suburban Farm.* By J. Bligh Monck.

Prize Essay.*

Many persons who are led by the social and other advantages of town life to give it the preference, nevertheless acknowledge the superior beauty, healthiness, and other attractions of the country. The bright corn fields, the orderly array of luxuriant "bracts," the cheery faces of the rural population, the readiness with which a bountiful nature perfects the work of the husbandman, hold out to them a very tempting prospect. But what if the enjoyments of either way of life can be combined by the occupation of a farm close to a town! What position can be so desirable, presenting such ready opportunities for selling on the spot the more bulky and perishable articles of your production, and again of procuring close at hand the refuse which your customers are anxious to be rid of?

As I find many practical farmers hold this opinion, and the generous offer of a prize for the best description of suburban farming, almost implies that some special management is essential to success near towns, I venture to offer the result of twenty-five years' experience on a gravelly soil liable to burn, in the immediate vicinity of a borough of upwards of 20,000 inhabitants. I shall have to consider the advantages attendant on such a situation with its accompanying drawbacks, that I may assist owners and occupiers of land under the like circumstances, in turning the one to the best account, and in making light of the other.

But first it will be well for me to explain what I mean by a farm, and by farming profitably. It is well known that in the

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* This Prize was placed at the disposal of the Society by Sir Compton Domvile, Bart.

immediate neighbourhood of every town small portions of land can be let for large annual rents, from four to five pounds per acre higher than those paid for the same class and quality of land some seven or eight miles further off. These rents are given gladly by gentlemen for the purpose of keeping their cow or pair of horses; by butchers for a lair for their stock till the killing day; by nurserymen and market-gardeners, and many others, who use the land merely as a part of the premises necessary to carry on their retail trade. Of these the market-gardener makes the nearest approach to being a farmer, but differs from him in that he makes his profit (and consequently his rent) not by the production of the crops he grows, but by their retail delivery—of which more hereafter. I shall exclude these, as also cattle-dealers and small milkmen, who keep a cow or two for the supply of the shop, or to carry round milk, &c., to their customers, for the same reason; reckoning as farmers those only who make a living by the land they cultivate, and get a sufficient return from it to live as farmers—employers of labour, not labourers themselves. Again, as regards the returns or profits of the method of farming I recommend, I think I shall best avoid a very uncertain and unsatisfactory discussion by giving, not the actual figures of a balance-sheet, but the extra results arising from improved methods, which any one experienced in farming can add to the average prices of his own neighbourhood, and compare with the different values of land and produce which there prevail, according to soil, climate, and situation. The reader will thus be enabled to adapt my suggestions to his own individual position, and will not so readily take exception to figures which, however correct in my case, may be quite inapplicable in another's, or to profits which may be as unreasonably large in one man's opinion, as they are small in that of another. I shall also assum[illegible] (as the Chancellor of the Exchequer does) that a sum equal t[illegible] half the rent is a fair annual profit for a tenant.

Nearly thirty years ago I was forcibly impressed with [illegible] act, that land let to a farmer on one side of a boundary-he[illegible] [illegible]etched about 30*s.* per annum, and the adjoining land, [illegible] precisely the same circumstances, was taken by a mark[illegible] gardener at 5*l.*; while the latter was making money, the farm[illegible] could barely get a living. I therefore determined to try [illegible] myself whether, without losing my position and independence [illegible] farmer, I could not realise some advantage from having [illegible] large body of consumers in my immediate neighbourhood, a[illegible] luckily, began with a few acres at first to learn my lesson [illegible] [illegible]t my ideas to the test of practice. My first efforts were, as usual with young beginners, unsuccessful. I endeavoured [illegible] [illegible] for sale, supplied straw to butchers and ho[illegible]

ers, receiving dung in return; but I soon discovered, what I find to be a general rule in all trades, that the retail dealer . the middle-man between the producer and the consumer— all the profit. I grew some excellent crops of vegetables, ould not sell them unless I went about myself with a hand- w. For cabbages—sold in the shops at 2*d.* a head, or turnips ing 2*d.* a bunch, which at this rate would have realised per acre — I was offered 3*d.* or 4*d.* per dozen by the grocer. This, with the trouble of weeding out all the or ones, and the drawback of cleaning and delivering in lots, and waiting for the money, at last produced a worse 1 than I could obtain by feeding cows. Early peas gave ıme result. A fine crop, which at the greengrocer's price of er dish would have made 40*l.* to 50*l.* per acre, only brought nany shillings less than I made eventually by selling the ıce as seed.* This was my first disappointment. I now hat I can sell a fair quantity of potatoes during the winter, ıow and then a few tons of mangold-wurzel or carrots in the g, at very remunerating prices; but as soon as there is any al demand for these, the farmers at a distance glut the et, and reduce the price to little over the feeding value.

' next disappointment was my dung-heap. Though I got ıe straw some hard cash besides the manure, this barely ed the expense of getting it out of the pit (always up a w courtyard) and loading. And after all it was not spit- ; some was only dirty straw, and had to be used again ' my own cattle; some was so heated and fire-fanged that s not fit for the heap—all had to be turned over once or before it was fit to plough in; so that it cost me full 5*s.* a oad by the time I had spread it; and I found I could make wn straw into dung at that price. I now sell all the straw spare at from 50*s.* to 60*s.* the ton, and buy good spit-dung, r use, as I want it—that is to say, when I have leisure to it, and land ready to receive it. Having bought thus much perience, I took in hand the rest of the farm, consisting of .cres of arable, and rather more of meadow-land, from which e succeeded in reaping a considerable increase, if not the mount of my hopes, in rent and profit. Two objects have

ım informed on good authority that near Tamworth the *farmer* makes about s. for a good crop of green peas, sold standing in his field. They are grown ɔly Birmingham. Sangster's No. 1 is a favourite variety. The proximity canal and railroad is favourable. Several gardeners in this neighbourhood or 50 acres, at rents varying from 8*l.* to 10*l.* per acre, and employ from 20 ıen. The dry sewage refuse and sweepings of Birmingham are here rising te both for garden crops and for pasture: at Tamworth such manure often r 4*s.* per ton, little more than cost of carriage by barge—the supply exceeds nand.—P. H. F.

been kept constantly in view—to increase the quantity and quality of the dung; and, as a consequence, to grow the utmost amount of saleable produce. I now keep a herd of above 30 cows, or about 25 in full milk all the year round. These are soiled in the house, except from Midsummer to Michaelmas, when they go out into the meadows. They are fed in winter on chopped hay, straw, and roots, with bought grains, malt-dust, and a little meal. The milk is sold to milkmen, who fetch it from the cow-house door, and pay 2*d.* a quart, ready money. Each cow produces 20*l.* per annum, which, I reckon, pays for her keep, leaving me the dung for the litter. This latter I economise as far as possible by running all the liquid into a tank, to be drawn over the grass-land; a very small quantity of straw is then required to absorb the remainder. This is further improved by the manure of 100 pigs fatted every winter. With this, and the help of four cart-horses, I am enabled to thoroughly dress one-third of my arable land every year. I plough it in 14 inches deep, with a second plough following in the furrow of the first, and thereby secure very large crops of roots: these are nearly all drawn for the cows or for sale, the tops and refuse being left to be penned over by sheep; the second year, wheat; the third, barley, partly after stubble turnips fed off. After twenty years' repetition of this three-course rotation, I now get an average of 40 bushels of wheat, and the same of barley, the latter of prime malting quality, unless where the sheep, remaining too long on the turnips, have made it rank. By thus keeping two-thirds of my land in corn, I get a large quantity of wheat-straw for sale, of barley-straw for fodder for the cows, besides a few acres of potatoes and roots for sale. The horses and cows eat about three-fourths of the meadow-hay, and leave the rest for sale. The meadows mown every year are kept in condition by refuse ashes, road-dirt, and inferior dung bought in the town, of which large quantities can be procured for less than 2*s.* the one-horse load, or about 2*l.* per acre, every third or fourth year.

In assessing the profits of my farm, I shall compare it with 200 acres of similar land at a distance, the arable being supposed to be farmed highly on the four-course system, and cows kept for the sale of butter or calves, or beasts fatted in yards with the same amount of purchased food:—

Net produce of 30 cows, at 20*l.* per cow	£600	
Deduct usual produce of do. at 14*l.*	400	
Leaving a profit on selling milk		£200
Arable produce of 33 acres of wheat × 5 qrs.	165 qrs.	
Instead of 25 acres do. × 4 qrs. ..	100	
Increase	65 qrs.	

Brought forward		£200
Profit on 65 qrs. at 55*s.* average price (nearly) ..	£180	
Add 8 tons of wheat-straw	20	
		200
Produce of 8 acres of barley additional = 40 qrs., 37*s.*		75
Potatoes or roots sold, say 5 acres net		50
Hay sold, say 10 tons only		50
		575
Deductions.—Extra rates	£50	
Do. cost of labour	100	
Manure purchased	50	
		200
Leaving as clear profit of suburban farm over the same under the usual management		£375

In order not to burden the above account with any unnecessary figures, I have omitted all mention of profit from sheep or pigs, which in my case is pretty much the same as in that of other people. I fat off about 100 pigs and wethers, and lamb down 100 ewes, which are sold with their lambs in the spring. The 28 acres of roots which enable me to keep this stock, besides supplying some 500 tons of mangolds, turnips, &c., to my 30 cows, manifestly give as good a return as 50 acres of fallow-crops under ordinary management.

I come now to the deductions, with which I have debited the account. I find the general rateable value of a farm situate as mine is to be about 1*l.* per acre more than if it were away from the town, and the rates, including a borough-rate instead of county-rate, to be somewhat higher; I have, therefore, deducted 50*l.* on that head. I find, too, the labour-bill is large. House-rent near towns is very high. Common labourers, through the summer, can get their half-crown or more per day, and consequently will not work at farmers' prices, even for constant employment. There is also a little more expense incurred in mending fences, bird-keeping, &c. The 50*l.* worth of ashes, &c., is as much as we have time to cart home in the course of the winter. After making these necessary allowances, the handsome balance of 375*l.*, or nearly 2*l.* per acre, remains to be divided between the landlord and the tenant. I have obtained this result now for a series of years with great regularity; indeed there is very little difference in the amount of the corn-crop between good years and bad years.

In comparing this system with others that have been recommended, I am convinced there is none more profitable, more easily adapted to all circumstances of soils, seasons, or markets. If two successive corn-crops to one root-crop be thought too scourging, nevertheless my experience tells me, that with thorough

deep cultivation and a plentiful supply of manure, the land, which was naturally poor, has improved under such treatment. I find also that I can make this manure cheaper on my own premises, taking into consideration all the attendant expenses, than I can purchase it. Indeed, on this latter point I believe that farmers very generally deceive themselves. Partly owing to prohibitions in their leases to sell straw, and partly from a habit of looking at the size of their dung-heap, instead of calculating its quality, they have been content with spreading ten cart-loads per acre of dirty litter from a fold-yard, and calling it a dressing; whereas, if they were allowed to sell a part of it, and were to cut up a good portion for cattle food, mixed with bought cake or meal and chopped roots, they would still find that enough remained, if used economically, and under cover from rain, to absorb the excreta of three times as much stock as they now keep loose in a straw-yard. The same number of cart-loads per acre would then double the amount of the crops produced, and even at present prices leave a very handsome balance to the farmer. While meat and wool are dear and offal corn so cheap, I believe that manure can be made for nothing; deep cultivation, therefore, with thorough manuring and great attention to cleanliness, will enable any man to follow my rotation with the same result. As roads improve and railway stations multiply, every farm is becoming comparatively more suburban—that is, nearer to the dearest market for sale of bulky produce, and to the cheapest for the purchase of feeding-stuffs or manures. With this encouragement, let the agriculturist deepen his soil gradually, using an admixture of the subsoil to freshen the top-soil; he will then find his crops annually increasing, and his land less dependent on a wet or dry season. When he realises, as I have attempted to show he may do, a net increase of 30*s*. to 40*s*. per acre, he will not grudge his landlord an extra rent. Should he succeed in so doing, he will be ready to thank me for publishing my experience. Should he fail on the first trial, as I did, let him not despair nor charge the drought or the blight with having caused his ill-success; but, putting his faith in the bounteous gifts of Nature, let him redouble his efforts after clean, deep cultivation, with high manuring, and he will assuredly not lose his reward.

XVI.—*On the Absorption of Potash by Soils of Known Composition.* By Dr. Augustus Voelcker.

We are indebted to Professor Way for a series of remarkable xperiments, showing that soils not only possess the power of bstracting free potash from its solution in water, but are apable also of separating this important alkali from its saline ombinations. Since the publication of Professor Way's inteesting and highly valuable Papers "On the Absorbing Properties of Soils," I have been engaged in studying the changes which iquid fertilizing matters undergo in contact with soils of known hemical composition.*

As a further instalment to these soil-studies, I have now the leasure of recording the results of experiments made with a view of ascertaining to what extent soils of various chemical characters bsorb free potash from its solution in water, and to what extent the same soils separate potash from its soluble salts and retain t in a comparatively speaking insoluble state.

I. Series of Experiments on the Absorption of Caustic Potash.

Clay soils, it is well known, possess in a high degree the power of absorbing potash, and this they are generally considered to exert with greater or less avidity according as the clay varies in stiffness. On the other hand, sandy soils are believed to be deficient in this power of fixing potash, which next to phosphoric acid and ammonia, is, no doubt, the most valuable fertilizing constituent. These conclusions confessedly rest on a very limited range of experience, so that any additional information on this subject will be of some use. The soils selected for the following six experiments were :—

1. A calcareous soil.
2. A stiff clay.
3. A fertile sandy loam.
4. Soil from a pasture, being a vegetable mould, containing bundance of organic matter, and a fair proportion of sand nd clay.
5. A marly soil.
6. A sterile sand, containing a good deal of organic matter and scarcely any lime.

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* The results of experiments on this subject have been published by me in this Journal, in Papers bearing the respective titles: "On the Changes which Liquid Manure undergoes in Contact with Soil;" "On the Chemical Properties of Soils;" and "On the Absorption of Soluble Phosphate of Lime."

The potash solution used alike in all six experiments was produced by dissolving 40·47 grains of chemically pure hydrated caustic potash, KO, HO, in four decigallons (28,000 grains) of water. The solution consequently contained ·1445 per cent. of hydrated caustic potash, or ·1213 per cent. of anhydrous potash.

Experiment No. 1.—Absorption of Caustic Potash by Calcareous Soil.

This soil on analysis yielded the following results:—

Moisture	3·62
Organic matters	4·23
Carbonate of lime	67·50
Oxides of iron and alumina	7·54
Magnesia	·44
Potash and soda	·79
Insoluble siliceous matter	15·88
	100·00

It will be observed that this soil, in which carbonate of lime is the preponderating constituent, contains but little clay and organic matter; it is, in point of fact, a chalk marl. The potash solution, as stated above, was placed with 3,500 grains of this soil in a glass-stoppered bottle, and left in contact with it for four days, during which time this mixture was shaken up at intervals, and then allowed to settle. A decigallon of the liquid was then drawn off and filtered perfectly clear. The clear liquid was boiled with baryta water, and by this means all earthy matters taken up from the soil were removed. The excess of baryta was next removed, and the resulting liquid having been evaporated to dryness, the residue was heated strongly, and the potash in it determined by bi-chloride of platinum.

	Anhydrous Potash (K O).
Before contact with the soil, 1000 grains of the solution contained	1·213
After contact	·413
Difference	·800

[illegible] grain [illegible] anhydrous potash was thus fixed in the soil from [illegible] 1000 [illegible] of solution, consequently 22·40 grains were [illegible] whole solution (28·000 grains), and fixed by [illegible] soil. 1000 grains of this calcareous soil thus [illegible] grains of potash. In this experiment it appears [illegible] round numbers, two-thirds of the potash was absorbed, [illegible] third remained in solution.

Experiment No. 2.—On Stiff Clay.

The clay used in this experiment was an extremely stiff and retentative Essex clay, containing but little lime and sand, as the following analysis further shows.

Mechanical Analysis.

	Subsoil.		Surface-soil.
Moisture	9·46	....	3·91
Organic matter and water of combination	4·87	....	4·80
Clay	75·29	....	78·13
Lime	1·12	....	2·19
Sand	9·26	....	10·97
	100·00		100·00

Chemical Analysis.

	Subsoil.		Surface-soil.
Moisture	9·46	....	3·91
Organic matter and water of combination	4·87	....	4·80
Oxides of iron and alumina	17·38	....	7·85
Phosphoric acid	·06	....	·04
Carbonate of lime	1·02	....	2·08
Sulphate of lime	·13	....	·15
Magnesia	·92	....	·32
Alkalies and loss	·45		
Insoluble siliceous matter (chiefly clay)	65·71	....	80·85
	100·00		100·00

1750 grains of subsoil and an equal quantity of surface soil were shaken up in a bottle with the potash-solution, and allowed to remain in contact for a period of four days. One decigallon of the liquid was then filtered off, and the amount of potash accurately determined, as in the preceding experiment.

	Anhydrous Potash (K O).
Before contact with soil the solution contained, in 1000 grains	1·213
After contact	·399
Difference	·814

The whole liquid employed in this experiment consequently parted with 22·792 grains of caustic potash, which were fixed by 3500 grains of soil. 1000 grains of this clay accordingly absorbed 6·51 grains of anhydrous potash.

Experiment No. 3.—On a Fertile Sandy Loam.

The soil used in this experiment was a friable, red-coloured, fertile, light, turnip loam, and yielded on analysis the following results:—

Moisture	2·95
Organic matter and water of combination ..	6·75
Oxides of iron and alumina	6·10
Carbonate of lime	1·22
Alkalies and magnesia	1·20
Insoluble siliceous matter (sand and some clay)	82·22
	100·44

The solution of potash was combined with 3500 grains of this soil and treated as before.

	Anhydrous Potash.
4 decigallons of potash, solutions, before contact with 3500 grains of soil, contained	33·966
After contact	14·031
Potash absorbed by the soil	19·935

According to these determinations, 1000 grains of the fertile turnip loam absorbed only 5·69 of anhydrous potash, which is less than the quantity absorbed from a solution of the same strength by the stiff clay and the calcareous subsoil used in the preceding experiments.

Experiment No. 4.—On Pasture Land.

The analysis of this soil yielded the following results:—

Moisture	2·420
Organic matter	11·700
Oxides of iron and alumina	11·860
Carbonate of lime	1·240
Sulphate of lime	·306
Phosphoric acid	·080
Chloride of sodium	·112
Potash (soluble in acid solution)	·910
Soluble silica	4·090
Insoluble siliceous matter	67·530
	100·248

The insoluble siliceous matter here mentioned consists [illegible]out equal proportions of clay and sand. The soil, it will [illegible]en, is rich in organic matter, and also contains a fair proporti[illegible] [illegible]f soluble potash. Like other pasture land, rich in organ[illegible] [illegible]atter it is rather deficient in lime, and would be much improve[illegible] [illegible]ing. The experiment was in this instan[illegible] [illegible] the same manner as before.

	Anhydrous Potash.
[illegible] contact with the soil, 1000 grains of potash solution contained	1·213
[illegible]	·390
[illegible] ..	·823

Accordingly 1000 grains of this pasture land absorbed 6·57 of potash.

Experiment No. 5.—On a Marly Soil.

The soil employed in this experiment, on analysis, was found to contain in 100 parts:

Moisture	4·72
Organic matter and water of combination	11·03
Oxides of iron	9·98
Alumina	6·06
Carbonate of lime	12·10
Sulphate of lime	·75
Magnesia and alkalies	1·43
Soluble silica (soluble in caustic potash)	17·93
Insoluble siliceous matter (chiefly clay)	36·00
	100·00

The experiment was made precisely as before, with the following result:—

	Anhydrous Potash.
Before contact with soil, the solution contained ..	33·966
After 4 days contact..	8·554
Potash absorbed by 3500 grains of soil ..	25·412

1000 grains of this soil accordingly, absorbed 7·26 grains of anhydrous potash. In this experiment more potash was absorbed than by any of the preceding soils, not excepting even the stiff clay. It will also be noticed that this marly soil contained a large proportion of soluble silica, as well as a considerable amount of oxide of iron and alumina. I find that soluble silica and the hydrated oxides of iron and alumina possess the power of fixing potash in a large proportion, and their presence in a well cultivated clay or marly soil affords thus a guarantee for its retention of potash. In many stiff clays, however, that have never been exposed to the ameliorating influence of the atmosphere, the oxides of iron and alumina, as well as silica, occur in a state in which they are not readily acted upon even by powerful chemical re-agents, and in this condition we have good grounds for believing they do not possess the power of absorbing potash or ammonia in any marked degree. Good and deep cultivation, by facilitating the action both of air and water, not only unlocks the mineral treasures already stored in the soil, but also brings the land into a mechanical and chemical condition, which enables it to retain the fertility imparted to it by natural or artificial manures.

Experiment No. [illegible].—On Sterile Sand.

[illegible] soil selected for experiment was a very sterile, red, ferruginous sand, containing scarcely any clay, mere traces of lime, and much oxide of iron, as will be seen by the following analysis:—

[illegible]	1·43
*[illegible] matter	3·39
[illegible]	12·16
[illegible]	·15
[illegible] and magnesia	·46
[illegible]	82·41
	100·00

*Containing nitrogen	·21
Equal to ammonia	·25

[illegible] grains of this soil left in contact with the potash solution for [illegible] days gave the following results:—

	Anhydrous Potash.
Before the experiment the solution contained	33·906
After [illegible]	12·413
[illegible] by [illegible] grains of soil	21·533

[illegible] grains of this sterile sand consequently absorbed 16·16 grains of caustic potash. In this series of experiments the following quantities of caustic potash were thus absorbed by 1000 grains of

	Potash (KO). Grains.
1. Calcareous soil	6·40
2. Heavy clay	6·51
3. Fertile sandy loam	5·69
4. Pasture land	6·57
5. Marly soil	7·26
6. Sterile sand	6·16

These six soils differ greatly in their physical and chemical constitution, ranging from the heaviest clay land at the one extremity to the lightest of poor sands on the other. In every instance a considerable proportion of caustic potash was absorbed; it may therefore be safely inferred that all soils, no matter what their composition, possess the power of separating caustic potash from its solution in water. This power, as has been already shown, differs in various kinds of soils, and is sometimes greater in poor or sterile soils than in good or rich arable or pasture land. However, with respect to the absolute quantity of potash which a soil is capable of absorbing, we must be careful to avoid a hasty judgment, for actual experiments show that the amount of potash which is fixed by a given quantity of soil depends

ety of conditions. Thus 1000 grains of a soil which periment is found to separate 561 grains of caustic m a weak solution, will take up two, three, and four much if brought into contact with a much stronger Therefore, as in the case of caustic ammonia, the f the solution materially affects the amount of potash y the soil. Again, the relative proportions of soil and ermine in some measure the quantity of potash absorbed. circumstances, therefore, in addition to the variations ely chemical constitution of different soils, materially result. Another striking similarity between the absorptash and that of ammonia is presented to us in the fact absorption by the soil of these and, in all probability, ertilizing matters, is never complete. It does not matter strong or a weak solution of potash is passed through hether more or less of liquid is employed, or in the experiment is modified, in every case the liquid assage through the soil will be found to contain more or h, showing that its complete absorption by the soil, r the most favourable conditions, is impossible.

ES OF EXPERIMENTS.—ABSORPTION OF POTASH FROM SOLUTION CONTAINING CARBONATE OF POTASH.

much pleasure in recording here some careful experide some years ago in my laboratory by Mr. Charles a pupil of mine, who took particular interest in my ion of the absorbing properties of soils. At my request ps experimented with two soils,* which possess similar haracters, but differ chiefly in the proportions of carlime which they contain. Both are calcareous clay moderate depth, and tolerably open character. They ain clay in preponderating proportions, and hardly any h can be separated by washing. Submitted to analysis hilips they gave the following results:—

A. *Mechanical Analysis.*

	Field No. 7.	Field No. 12.
ture	8·81	13·29
nic matter and water of combination	8·63	9·81
e	4·98	9·17
l	2·82	4·88
	74·76	62·85
	100·00	100·00

* from fields on the farm attached to the Royal Agricultural College, marked No. 7 and No. 12 on the map.

B. *Chemical Analysis.*

	Field. No. 7.		No. 12.
Moisture	8·81	....	13·29
Organic matter and water of combination	8·63	....	9·81
Oxide of iron	14·28	....	16·72
Alumina	3·29	....	2·46
Carbonate of lime	4·61	....	8·97
Sulphate of lime	·37	....	·28
Magnesia	1·03	....	·55
Potash	·46	....	·88
Soda	·21	....	·33
Phosphoric acid	·21	....	·03
Chloride of sodium	·02	....	·02
Soluble silica	8·20	....	4·29
Insoluble siliceous matter	50·10	....	42·20
	100·21		99·83

A watery solution containing ·55657 per cent. of pure carbonate of potash was employed in the following experiments.

3500 grains of each soil were mixed with 7000 grains of this solution, and after repeated agitations left to stand for twenty-seven hours. A portion of the liquid was then drawn off, boiled with baryta-water; the excess of baryta-water was next removed by carbonate of ammonia and a little free ammonia, and the filtrate evaporated to dryness; the residue was heated to redness, and then the potash determined by chloride of platinum. The following are Mr. Philips's results:—

	Carbonate of Potash. Soil No. 7. Grains.		Soil No. 12. Grains.
Before contact with soil the solution contained	38·9599	..	38·9599
After contact	8·5512	..	11·0306
Difference	30·4087		27·9293

Therefore 1000 grains of this soil from field No. 7 absorbed 8·6882 grains of carbonate of potash, equal to 5·9179 of anhydrous caustic potash. 1000 grains of the soil, from field No. 12, absorbed 7·9798 of carbonate, equal to 5·4355 of anhydrous caustic potash.

3rd Series of Experiments.—Absorption of Potash from a Solution containing Sulphate of Potash.

Experiments No. 1 and 2.

In the next two experiments a solution containing ·62128 per cent. of pure sulphate of potash was combined with the same two soils in the same proportions as before. Mr. Philips obtained the following results:—

	Potash, calculated as Sulphate of Potash. Soil No. 7.	Soil No. 12.
	Grains.	Grains.
·fore contact with soil the solution contained	42·4896	42·4896
:ter contact	11·7939	11·3347
Difference	30·6957	31·1549

·00 grains from field No. 7 absorbed 4·7148 of potash, equal 7702 of sulphate of potash. 1000 grains of soil from field 12 absorbed 4·8088 of potash, corresponding to 8·9014 ıs of sulphate of potash. On comparing these results with : previously obtained on the same soils with carbonate of ·h, it appears that potash was not separated in so large a ɔrtion from its combination with sulphuric as from that with ›nic acid.

:riment No. 3.—On the Sulphate of Potash on a Marly Soil.

.e soil in this instance was the same on which the experi- with caustic potash had been made. 1 lb. of this soil was d with 8 decigallons of distilled water and 120·8 grains of sulphate of potash. The greater portion of the solution was n off after standing four days. 2 imperial pints of the per- · clear solution on evaporation to dryness gave a residue, hing 37·77 grains, dried at 300° Fahr.

ıis residue, on analysis, gave the following results:—

	Grains.
Organic matter and water of combination (loss on heating)	1·690
Soluble silica	·050
Oxides of iron and alumina, with traces of phosphoric acid	·050
Sulphate of lime	12·294
Sulphate of magnesia	·617
Sulphate of potash	22·272
Chloride of potassium	·470
Chloride of sodium	·390
	37·833

cording to these determinations, the total solution (8 deci- ıs) after contact with 1 lb. of soil, contained:—

	Grains.
Organic matter and water of combination	5·408
Soluble silica	·160
Oxides of iron and alumina, and traces of phosphoric acid	·160
Sulphate of lime	39·340
Sulphate of magnesia	1·974
Sulphate of potash	71·270
Chloride of potassium	1·504
Chloride of sodium	1·248
	121·064

This amount of solid matter is nearly identical with that which the solution contained before the admixture, viz., 120·8 grains; but it is no longer exclusively sulphate of potash, but a combination of salts, in which sulphate of potash and sulphate of lime are most conspicuous.

It will be remembered that this soil contained a good deal of carbonate of lime, and it will be seen at a glance that whilst a certain amount of potash became fixed, the sulphuric acid with which the potash was originally combined passed through the soil principally in union with lime. Before filtration the solution contained:—

	Grains.
Sulphuric acid	55·540
Potash	65·260
	120·800

After filtration through the soil, the whole solution contained potash, 39·565 grains; consequently, 25·695 grains of potash were absorbed by 1 lb. or 7000 grains of soil, and 1000 grains of soil absorbed 3·671 grains of potash.

The sulphuric acid in the liquid after filtration through the soil is distributed as follows:—

23·141	grains are united with lime
32·653	,, ,, potash and
1·316	,, ,, magnesia.
or 57·110	grains of sulphuric acid altogether.

No absorption whatever of sulphuric acid thus took place. Indeed, the filtered liquid contained a little more sulphuric acid than originally existed in the 120·8 grains of sulphate of potash. This slight excess arises from a small quantity of sulphate of lime naturally existing in the soil, which augments the quantity produced by the sulphuric acid of the decomposed sulphate of potash.

The preceding analytical results are interesting, as affording a positive proof of the fact that a solution of a single salt like sulphate of potash in percolating cultivated soils, gives rise to a great variety of new chemical soluble combinations, several of which exercise important functions in the nutrition of plants.

[illegible] with Sulphate of Potash on a Sterile Sandy Soil.

[illegible] with the preceding experiment, a solution of [illegible] of potash was tried upon the sandy soil, of which the [illegible] in [illegible] early part of this Paper (see p. 338, [illegible]

The experiment was conducted in precisely the same manner as in No. 3.

2 imperial pints of the solution, after contact with the sandy soil, on evaporation, gave a residue, which dried at 300° Fahr., weighed 37,700 grains. This residue, on analysis, yielded the following results:—

Organic matter and salts of ammonia	2·540
Soluble silica	0·40
Oxides of iron and alumina, with traces of phosphoric acid	·040
Sulphate of lime	1·550
Sulphate of magnesia	·504
Chloride of potassium	·932
Sulphate of potash	31·847
	37·453

The sum total of the separate constituents of this residue, it will be seen, agrees as well as can be expected with the amount obtained by direct evaporation of 2 pints of liquid.

Calculated for 8 decigallons of liquid brought in contact with one pound of soil, we obtain the following results:—

	Grains.
Organic matter and salts of ammonia	8·128
Soluble silica	·128
Oxides of iron and alumina, with traces of phosphoric acid	·128
Sulphate of lime	4·960
Sulphate of magnesia	1·612
Chloride of potassium	2·982
Sulphate of potash	101·910
	119·848

Before contact with soil, the whole solution contained 120·8 grains of solid matter; after contact, 119·848 grains, or very nearly the same amount. Whilst, however, the concentration of the filtered liquid was scarcely altered, its composition underwent material changes in its passage through the soil.

Before the experiment the solution contained:—

	Grains.
Potash and sulphuric acid	65·260 55·540
	120·800

After filtration through the soil, the whole solution contained potash, 56·936 grains; consequently, 8·324 grains of potash were absorbed by 7000 grains of soil, or 1000 grains of soil absorbed in this experiment only 1·189 grains of potash.

The sandy soil thus possessed the power of absorbing potash from a solution of sulphate of potash, in a very much more feeble

degree than the marly soil, which it will be noticed absorl from the same solution more than three times as much potash.

The residue obtained on evaporating the filtered liquid, c tained 50·847 grains of sulphuric acid, of which

46·855	were united	with	potash
2·917	„	„	lime and
1·075	„	„	magnesia
50·847			

Before filtration, the solution contained 55·540 of sulph acid. It would appear, therefore, that sulphuric acid, as we potash, was absorbed in this experiment. This, however, is the case; for, on making a separate sulphuric acid determina in another portion of the solution after contact with soil, avoiding previous evaporation to dryness, I find in 8 deciga 56·368 grains of sulphuric acid, that is, a slight excess ove quantity of sulphuric acid in the 120·8 of sulphate of po which were dissolved in 8 decigallons of distilled water. is evident, therefore, that the evaporation to dryness of filtered liquid and heating of the residue, had the effect of sipating a considerable proportion of sulphuric acid. But a filtered liquid had no acid reaction, the acid could not be pr in a free state, and the question arises in what state of bination did it exist?

The experimental soil, it may be mentioned, had rec rather a heavy dressing of Peruvian guano. Digested water, it gave a brownish-coloured solution, which aff distinct indications of the presence of ammonia. A porti sulphuric acid, originally united with potash, doubtless p into the filtered liquid in combination with ammonia.

As sulphate of ammonia, like all salts of ammoni volatile at a high temperature, the evaporated and stro heated residue of the filtered liquid could not contair sulphate of ammonia; the analysis of this residue consequ yielded less sulphuric acid than the liquid from which i obtained. A careful determination of the amount of r formed ammonia in this soil showed that it contained ·1C cent. of ammonia. As 1 lb. of soil was used in the filt experiment, this evaporation of ready-formed ammonia i soil is quite sufficient to combine with the quantity of sulp acid that escaped on heating the solid matter left on evapo of the filtered liquid.

The result of this experiment is interesting in several res

1. On comparing the results obtained in passing a soluti sulphate of potash through the soil, it will be noticed that muc potash was retained than was the case when caustic potas

filtered through the same soil. This sandy soil contains a good deal of hydrated oxide of iron, a constituent well known to possess considerable chemical affinity for caustic potash, and none for sulphate of potash. In consequence of this special display of chemical affinity which manifests itself when a solution of caustic potash is passed through a soil containing hydrated oxide of iron, more potash was fixed than when a solution of sulphate of potash was brought into contact with the same soil.

2. It is worthy of special notice that the solution of sulphate of potash after filtration through the sandy soil contained a weighable quantity of sulphate of ammonia, which was not the case with the marly soil in the preceding experiment.

The power of soils to retain ammonia is generally assumed to be greater than their power of retaining potash. Here, however, an instance is presented to us in which a salt of potash, by acting on the ammoniacal combination in a soil, overcomes the supposed superior affinity of ammonia. Contrary to all expectation, ammonia, in combination with sulphuric acid evidently supplied by the sulphate of potash, passed into the solution, whilst potash took its place and was retained in the soil.

3. On comparing the analysis of the sterile sand with that of the marly soil, it will be seen that, whilst the former is very poor in lime, the latter contains it in a large proportion. In the sandy soil but little sulphate of lime was produced, on account of the deficiency of lime in the soil; and the consequence was, that sulphate of ammonia, as well as sulphate of lime, passed through the soil. In the case of the marly soil, there was sufficient lime present to lay hold of the sulphuric acid separated from sulphate of potash on the fixation of potash by the soil, and no sulphate of ammonia—at least not any appreciable quantity, passed through it. In other words, in these experiments the deficiency of lime in the sandy soil caused the elimination and loss of valuable ammoniacal compounds, which were retained in the marly soil. Under favourable circumstances, lime thus becomes, as in the case before us, a preserver of ammoniacal compounds in the soil.

4. The preceding experiments throw new light on the uses of lime in agriculture. We know practically how essential the presence of lime is for the healthy growth of every kind of cultivated produce. On soils very deficient in lime, most crops, especially green crops, are subject to all kinds of disease; and, consequently, roots fail altogether on such land, even if it has been liberally manured with good yard-dung or guano. Up to a certain stage, corn and roots grown under such conditions appear to thrive well, but as the season advances they sustain a check, and at harvest-time yield a miserable return. The remedy for such failures, which are not at all uncommon in

localities where poor sandy soils prevail, is a good dose of lime or marl, and then, and only then, farmyard manure or guano may be applied to the greatest advantage. Marl or lime alone does not suffice for meeting all the requirements of our cultivated crops on such poor sands, and though calcareous minerals supply a most necessary element of plant-food, and by acting on the latent stores of food in the soil, produce at first a most strikingly favourable effect upon vegetation, they soon fail to produce the desired effect if repeated too often, to the exclusion of other fertilizing matters. On the other hand, the most liberal application of farmyard manure of the best quality never produces so beneficial and lasting an effect on poor sandy soils as when they have been previously well marled or limed. On such land no doubt the proverb holds good:—

> "Lime and marl without manure
> Only make the farmer poor."

But at the same time I have a strong impression that on such land manure, without lime or marl, does not help much towards paying the rent. There are some soils which swallow up manure, with, so to speak, no satiable appetite, without ever feeling the better for the manure; they are appropriately called very hungry. On all such soils I have no hesitation in saying much manure is wasted, or the most is not made of it, if previously to the application of farmyard-manure, guano, &c., the land has not received a good dose of marl or lime.

My recent filtration experiments point out the reason why marl or lime is peculiarly valuable on poor sands. It is not merely by supplying in a direct manner a deficient element of nutrition that lime acts so beneficially on such soils, but because it preserves in the soil the more valuable fertilizing matters, which, like salts of potash or ammonia, rapidly filter through sandy soils, unless a sufficient quantity of marl or lime has been previously applied to the land. By these means the bases of the more valuable saline soluble constituents of rotten dung or of guano are retained in the soil, whilst the acids filter through it in combination with lime, a constituent which is, comparatively speaking, inexpensive.

4th Series.—Experiments with a Solution of Chloride of Potassium.

Experiment No. 1.—On Calcareous Soil.

3500 grains of calcareous soil * were mixed with a solution of 52·91 grains of pure chloride of potassium in 4 decigallons

* For analysis see p. 334.

of water; after standing four days the liquid was filtered off and the potash carefully determined.

	Chloride of Potassium.		Potash.
Before the experiment the solution contained	52·910	=	33·378
After contact with soil	33·044	=	20·854
Difference	19·866	=	12·524

Thus 3500 grains of soil absorbed 12·524 grains of potash contained in 19·866 grains of chloride of potassium, or 1000 grains absorbed 3·578 of potash. The amount of chlorine in 52·910 of chloride of potassium is 25·248 grains.

In the liquid, after passing through the calcareous soil, I found 25·324 grains of chlorine. The soil, therefore, absorbed no chlorine whatever.

Experiment No. 2.—On Clay Soil.

This and the next two experiments were made in precisely the same manner as No. 1.

	Chloride of Potassium.		Potash.
Before filtration the solution contained	52·910	=	33·378
After filtration	30·884	=	19·483
	22·026	=	13·895

1000 grains of soil consequently absorbed 3·97 of potash.

Experiment No. 3.—On a Fertile Light Sandy Loam.

	Chloride of Potassium.		Potash.
Before the experiment the solution contained 4 decigallons	52·910	=	33·378
After contact with soil	40·468	=	24·188
	12·442	=	9·190

1000 grains of soil, therefore, absorbed 2·626 grains of potash. This soil, it will be seen, absorbed a good deal less potash than the clay soil.

Experiment No. 4.—On Pasture Land.

	Chloride of Potassium.		Potash.
Before the experiment the solution contained	52·910	=	33·378
After contact with soil	32·060	=	20·225
	20·850	=	13·153

1000 grains of this soil thus absorbed 3·758 grains of potash. In the filtered liquid which passed through this soil, I found 25·32 of chlorine, chiefly in combination with lime, which

agrees almost exactly with the amount of chlorine in 52·910 o chloride of potassium. Another proof is here given that the electro-negative portion of the chloride of potassium entirely passed through the soil, and the base of the decomposed salt alone was absorbed by the soil.

Experiments No. 5 and 6.—On Calcareous Clays.

The two following experiments were tried by Mr. Philips on soils from fields No. 7 and No. 12 of the Royal Agricultural College farm:—

The solution of chloride of potassium was much stronger than that employed in the preceding experiments. In both experiments a solution containing ·6617 per cent. of chloride of potassium was used. 3500 grains of each soil were shaken up in a bottle with 7000 grains of this solution of chloride of potassium. After a lapse of 24 hours, the greater portion of the liquid was filtered off perfectly clear, and the potash determined in a weighed quantity.

The following results were obtained by Mr. Philips:—

Experiment No. 5.—Soil from Field No. 7.

	Chloride of Potassium.		Potash.
Before filtration the solution (7000 grains) contained	46·319	=	29·221
After filtration	18·207	=	11·487
Difference	28·112	=	17·734

Consequently 1000 grains of soil absorbed 5·066 grains potash.

Experiment No. 6.—Soil from Field No. 12.

	Chloride of Potassium.		Potash.
Before the experiment the solution contained	46·319	=	29·221
After contact with soil	8·020	=	5·059
Retained by 3500 grains of soil ..	38·299	=	24·162

1000 grains of soil thus absorbed 6·903 of potash.

These filtration experiments, No. 5 and 6, show that soils absorb a much larger quantity of potash from a stronger solution of chloride of potassium than from a more dilute one.

Experiment No. 7.—On Sterile Sandy Soil.

In this and the next experiment 7000 grains of soil were shaken up with a solution of 104·55 grains of chloride of potassium in decigallons of water; the liquid was drawn off after four days, and analysed. 2 pints on evaporation gave a residue which, dried 300° Fahr., weighed 32·540 grains.

)n analysis, this residue gave the following results:—

	Grains.
Organic matter and ammoniacal salts	2·840
Soluble silica	·050
Oxides of iron and alumina, with traces of phosphoric acid	·050
Sulphate of lime	1·493
Chloride of calcium	·033
Chloride of Magnesium	·261
Chloride of sodium	·110
Chloride of potassium	27·590
	32·427

According to these determinations, the whole solution (8 deci-
lons) contained:—

	Grains.
Organic matter and salts of ammonia	8·088
Soluble silica	·160
Oxides of iron and alumina, and traces of phosphoric acid	·160
Sulphate of lime	4·777
Chloride of calcium	·105
Chloride of magnesium	·835
Chloride of sodium	·352
Chloride of Potassium	88·288
	102·765

	Chloride of Potassium.		Potash.
Before the experiment the whole solution contained	104·550	=	65·957
After filtration through the soil, it contained	88·288	=	55·699
	16·262	=	10·258

)00 grains of sandy soil, according to this result, absorbed
1·465 grains of potash. This soil thus possesses, in a much
ker degree, the power of separating potash from its chloride
any of the other kinds of soil experimented upon. The
unt of chlorine in 104·55 grains of chloride of potassium
d in this experiment) is 49·819 grains. The residue that
ld be left on evaporation of the whole solution of chloride
potassium after filtration through the soil, contained, after
ting, 42·976 of chlorine, namely:—

·063	grains in combination with		calcium
·624	,,	,,	magnesium
·213	,,	,,	sodium and
42·076	,,	,,	potassium
42·976			

We might hence infer that chlorine had been absorbed by this soil; but having previously ascertained the presence of ammonia in the soil, we may rather assume that this entered into combination with the chlorine, and so passed out; while the potash, as evidently was the case, became fixed. Being volatile, chloride of ammonium could not be present in the residue, hence the deficiency of chlorine in the analysis of the heated residue. That chlorine was not retained by the soil appears from a direct chlorine determination which I made in the filtered solution, instead of in the residue left on its evaporation. Calculated for the whole liquid (8 decigallons) I found 49·392 of chlorine in the liquid after filtration through the soil, which agrees closely with the amount of chlorine in the chloride of potassium solution.

It is remarkable that both the solutions of sulphate of potash and of chloride of potassium in passing through this soil lost but little potash, and caused the solution of a certain amount of ammonia contained in the soil.

*Experiment No. 8.—Absorption of Chloride of Potassium on a Marly Soil.**

Eight decigallons of the same solution as before were employed; 2 pints of the liquid filtered through the soil, on evaporation gave a residue weighing 32·781 grains, dried at 300° Fahr.

The analysis of this residue yielded the following results:—

	Grains.
Organic matter and water of combination	1·230
Soluble silica	·060
Oxides of iron and alumina, with traces of phosphoric acid	·050
Sulphate of lime	1·558
Chloride of calcium	7·890
Chloride of magnesium	·783
Chloride of sodium	·348
Chloride of potassium	20·976
	32·895

In conformity with previous experience, a considerable quantity of chloride of potassium when in contact with this clay-marl was decomposed; the potash of the decomposed salt alone became fixed in the soil, and the chlorine passed out principally in combination with calcium.

According to the preceding results, the whole solution (8 decigallons) after filtration through this soil, contained:—

* The composition of this soil will be found in p. 337.

	Grains.
Organic matter and water of combination	3·936
Soluble silica	·192
Oxides of iron and alumina, and traces of phosphoric acid	·160
Sulphate of lime	4·975
Chloride of calcium	25·248
Chloride of magnesium	2·505
Chloride of sodium	1·113
Chloride of potassium	67·123
	105·252

	Chloride of Potassium.		Potash.
Before the experiment the solution contained	104·550	=	65·957
After contact with 1 lb. of marly soil ..	67·123	=	42·346
Difference	37·427	=	23·611

.000 grains of this soil consequently absorbed 3·373 grains of ash, or nearly three times as much as the sandy soil.

.n this instance, as in all others, no absorption of chlorine k place.

	Chlorine.
Before filtration the liquid contained	49·819
After filtration through the soil	50·680

SORPTION OF POTASH FROM A SOLUTION OF NITRATE OF POTASH.

Jnder this head I have to mention only one experiment, de upon the same clay-marl that was used in several of the ceding trials.

!750 grains of this soil were shaken up in a bottle with)0 grains of a nitre-solution containing 25·55 grains of rate of potash. After standing three days the liquid was ered off, and potash and nitric acid determined in separate ighed quantities of the perfectly clear solution.

For the determination of potash the usual method was em- ›yed, and the nitric acid was determined by Dr. Pugh's :ellent process.

The following were the results of this experiment:—

	Nitric Acid.		Potash.
Before filtration the solution contained ..	13·657	=	11·893
After filtration through the soil, it contained	13·545	=	5·285
Difference	·112	=	6·608

It will be seen that the liquid after filtration through the soil tained very nearly the same amount of nitric acid as the ginal nitre-solution. The difference in the results amounts to ly about one-tenth of a grain, and is smaller than it would have

been had a less delicate and accurate plan for determining nitric acid been adopted than that recommended by Dr. Pugh.

Whilst the proportion of nitric acid in the solution before and after filtration remained unaltered, that of potash was much less in the liquid after its passage through this soil. According to the preceding results, 1000 grains of soil absorbed 3·776 of potash.

I have ascertained that the nitric acid from the decomposed portion of nitrate of potash passed through this soil almost entirely in combination with lime. The quantity of lime in the filtered solution weighed 4·270 grains; this is very nearly the theoretical equivalent for the quantity of potash fixed by the soil.

In this, as in all other cases, the base alone was absorbed by the soil, and the acid passed entirely into the filtrate. In most instances we have seen the acid of the decomposed potash-salt passed through the soil in combination with lime. Lime unquestionably has a powerful influence on the precise mode in which the absorbing properties of soils manifest themselves. Although the absence of lime in a soil does not prevent the display of the remarkable properties possessed by all soils of absorbing manuring matters, it can scarcely be doubted that the presence of much or little lime in a soil affects the precise mode in which these properties manifest themselves.

The chemical action of lime in relation to agriculture has hitherto been regarded too much apart from its connection with soil and manure. Useful information, I have no doubt, is likely to spring from a study of its use with special reference to its influence on the absorbing properties of soils.

12, *Hanover Square, London,*
July, 1864.

XVII.—*Accidents through Farm Machinery.* By Frederick Arthur Paget, C.E.

The benefits we derive from the use of steam-machinery may be said to annually increase by a law of rapid progression. But one deduction must be made from the sum total of these advantages. In a parallel line with the extending use of machines we have also an increase in number of disasters to life and limb. Machinery, like fire, is a very useful servant, but a terribly bad master. The steam "giant with one idea" has remorseless iron fingers, and woe to the living organism in their grasp. The well-made and well-kept steam-boiler is a docile instrument of wealth; but the ill-made, ill-kept boiler may at any moment turn a peaceful home

stead into a human slaughter-house; and one can seldom take up a daily newspaper without seeing in print an account of some fresh disaster caused by such machinery. Although, in the absence of statistical figures, isolated observations and impressions are necessarily vague and controvertible, it is very probable that the number of accidents caused by machinery, and recorded in the books of infirmary surgeons, would swell into a voluminous episode of "the simple annals of the poor."

At the beginning of last year a correspondent to 'The Times' showed that, during about two years and a half, twenty-three amputations had been carried out in the Hereford Infirmary on sufferers from machine accidents; while the number of minor cases, not requiring amputation, was even higher during the same period. There can be little doubt that similar returns from other agricultural districts would show an appalling amount of misery from this cause. The "minor" accidents are only less in a surgical sense, as a leg or an arm may evidently be disabled without being cut off. But we need not go far back in the annals of the Royal Agricultural Society itself to find instances of injuries caused by machinery. At the Battersea Show a bone-crushing machine crushed to bits the living bone of its attendant up to the shoulder. At the Warwick Show a man lost his life while putting the strap on the fly-wheel of a portable engine. At the Chester Show the excellent Consulting Engineer of the Society was compelled to forbid the working of certain portable engines with insufficiently stayed boilers. The ultimate histories of these steam mortars are probably recorded in the books of some county hospital.

Three separate classes—one might almost say three separate interests—are in direct contact with agricultural machinery. The maker who, manufacturing at a great expense of skill and capital, naturally wishes to sell his productions at the highest profit; the agriculturist who, on the contrary, wants an efficient machine at as cheap a rate as possible; and, lastly, the operative, who, for the time, becomes, as it were, a human link attached to the machine. Although our implements are in general not badly made, as an immense amount of skill and thought has been spent on their construction, neither are English agricultural employers over-greedy of gain; nor farm-labourers utterly careless, still it requires but little observation to see that the three classes are—sometimes singly, sometimes all three together—to blame; and that although, according to the doctrine of chances, a certain percentage of accidents will always happen by the use of machinery, the present rate may be much reduced. No greater—indeed, no other—objection can be brought against its use.

If we examine into the originating causes of any disaster we

mostly find them fall, with more or less precision, under following heads:—*1st*, A bad design, or workmanship, or terial, or all three, of the machine itself; *2nd*, A bad state the machine, from neglect of its repairs, which in the case a steam-boiler may lead to a total smash; *3rd*, The inhere dangerous nature of the operation carried on; *4th*, The us machinery under exceptional circumstances; *5th*, The carel ness of the operative himself. There is, perhaps, a somev illogical look in a classification of this kind, as all these ca are more or less in connection, but the division is, at l convenient.

1. The direct influence of the design and general make machine on its safe usage requires no demonstration. I well known that there is always a less proportion of accid through really good and simple machines—the chance of accident being diminished by the smaller number of worl parts. It is also evident that, *cæteris paribus*, the more auton the machine the safer is its management. But simplicity automatic action are two apparently contradictory qualities, extra skill on the part of the maker is no doubt require form a happy union of the two.

Besides a construction having a due regard to the app tion of the machine, proper provision should be made, w practicable, to fence in or "box up" the moving parts. clause in the Act passed some twenty years ago "for regulation of Mills and Factories," whereby the proper fen of machinery was rendered obligatory, is well known to lessened the average number of accidents through machi in the manufacturing districts. It would be very easy to bo the gearing of a fixed thrasher, for instance, but this w certainly not be practicable with the sides of a portable mac It would also be impossible to completely box-in a chaff-cu but no small number of accidents happen every year thr hese machines. The feed-rollers get clogged up, the atten ries to push the straw or hay forward with his fingers, an nan's hand gets squeezed in and cut off. The necessity for ngaging gear is here apparent. Indeed, as a rule, wherev part in motion cannot be fenced in or boxed up, means sh provided for immediately stopping the machine. Horse-g ed with a releasing arrangement—permitting the di nery to proceed while the horses and lay shafts stop— ad to dreadful accidents. The now general use of wro or of malleable iron, for the beater plates of thrashers m machines much safer than they were a few years ago. s well remembered that the cast-iron plates were often liab ly to pieces under the impulse of the centrifugal force develc

y the drum. 1 may be cited as an instance of the increase of safety through the use of an improved material.

2. The bad state of a machine from neglected repairs can only be, humanly speaking, the fault of the employer. For however well made a machine, an engine, or a boiler, may be when it leaves the hands of the maker, no skill in its manufacture can compensate for neglect during its use. There is no more striking application for the well-known Spanish saying about the lost horse-shoe nail causing the loss of the horse than to an ill-kept boiler. A neglect of the repairs of a machine simply ends in its refusing to work. The pound saved in little repairs and "stitches in time" leads to the expenditure of 9*l.*—perhaps 90*l.*—to meet the iron-founder's bill. In this instance, the employer has only himself to blame, and he suffers accordingly. But with a *steam-boiler* the evil is greater, for an explosion leads not merely to a loss of property, but also of life. The treatment undergone by agricultural boilers is indeed sometimes incredibly bad. The universal panacea for leakages appears to be cow-dung by the barrow-full, until, at last, the water spaces get filled with solid matter. It is only by walking the hospital of the repairing-shop of some agricultural implement maker that a fair idea may be gained of the way in which these engines are often treated. Nor do the boilers that have been repaired always leave the foundry in a safe state. A strict supervision should, as a rule, be given to repairs executed by contract. Many an explosion has happened from a bad patch. Those wishing for a sound explanation of these apparently unaccountable disasters may be referred to a little work on the question, by Mr. Zerah Colburn, C.E.* The intimate knowledge we now have of this subject—a knowledge greatly furthered by the systematic periodical examinations of the excellent Manchester Association for the Prevention of Boiler Explosions—has led most engineers to the conclusion that (supposing the boiler to have been properly made) the originating cause of an explosion is simply the neglected state in which the boiler was kept. But few engineers now believe that there is much mystery in the matter. By the simple weakening of a plate—either through undue pressure at some time or other, or through corrosion caused by leakage, or through neglected incrustation, or through burning a plate by letting the water get too low; through one or more of such causes—is a boiler explosion originated. Perhaps the rupture happily occurs *below* the water line, and then the water is simply gradually forced out, doing little or no damage. But not so when the rupture occurs *above* the water line. The superincumbent pressure is suddenly released from a large volume of

* Steam-Boiler Explosions. London: John Weale, 1860.

water in a state of ebullition. According to Professor A
"the gauge pressure being 60 lbs. per square inch, one c
foot of water is as destructive as one pound of gunpowder;
that a mere rent in the boiler plate of a common portable en
when at work can be equivalent to the application of a mat
a mine of gunpowder.

3. Even under the most favourable circumstances the
always some inherent risk to the attendant of a machine.
as an instance the feeding platform of a steam-thrasher, w
large opening at the level of the floor leading to a (say) 22-
drum, revolving at the rate of 1000 revolutions per minute,
necessarily only three-quarters of an inch distant from an uny
ing concave. A hooded drum is safer, but the hood im
the feeding. A practicable self-feeding arrangement woul
useful for a thrashing-machine. One or two shapes have
tried, but as yet unsuccessfully. Grinding bones by the
machines is an inherently dangerous operation. Steam-ploug
on stony land is also a little hazardous, as the ploughman is s
times suddenly jerked off the plough or cultivator.

4. Among instances of the use of machinery under except
circumstances may be classed thrashing by night in a na
barn, by the light of a couple of cheap candles. The use o
machinery at night is always attended with greater personal
When a portable machine is thrashing in the open coun
high wind is apt to blow about the chaff and straw and to r
it scarcely possible to keep the eyes open. In this case a
canvas hooding over the blowers and other parts is the
remedy.

5. The carelessness and ignorance of the labourer hims
course greatly swell the number of accidents through machi
although the use of machinery is already so extensive in En
that they happen but seldom from the pure ignorance o
operative. Many can be accounted for by the single word:—
A man in the least drunk should not be allowed to come
machines, much less to act as attendant. No idlers or
..kers on should be permitted to stand near machinery eit
..st or in motion. Any hurry or confusion is also an ev
..urce of danger.

..he mere action of time is doubtless tending to dim
..umber of accidents through farm machinery, as
... witnesses some advance and simplification of existing
..ines; but this progress will be necessarily slow, and
... fu... ..mpulse. The maker has the requisite know
... .ke machinery safe; but he has not the pow
...tion is too great, and prices are too small.
...iculturist would have the power, but he has not the s

engineering knowledge to tell him that an arrangement is unsafe. The labourer has neither qualification. It would evidently be to the interest of all three parties that machines should be safe.

Now, in the manufacturing districts of the North two institutions are already established for the prevention of accidents by steam-machinery. The system of factory inspection has existed with most beneficial results for more than twenty years. The Government inspectors have the power of directing the fencing off and other means for the safe usage of machinery. Emboldened by the example of the Government in this direction, the shrewd Manchester men, at the suggestion of Dr. Fairbairn, organized about seven years ago a system for the periodical inspection of steam-boilers. The Manchester Association is one of the most beneficial institutions of the country. Not merely has it saved many lives, but also much property, by teaching the proper management of the boilers and engines, and the saving of fuel. Every one of these skilled inspectors is, in fact, an instructor of steam-engineering. Could not these two systems be combined, under Government supervision, in the agricultural districts? The greater area of country covered by agricultural operations is of course a difficulty; but the agricultural shows collect machinery together, and, at least, the right of public exhibition should be refused to notoriously unsafe arrangements.

These remarks but slightly skim over a portion of an important subject. In these latter days, science has taught capital to utilize the great forces of nature; but has capital yet learnt a due regard for the safety of human labour? According to a Blue-book, published a few months ago, no less than one thousand two hundred and thirty-eight lives were lost in English coal and ironstone mines during the year 1862. Non-fatal and *merely* disabling accidents are not given. The miners are now clamouring for a greater number of government inspectors. The last published returns from the Inspectors of Factories give a total amount of one thousand five hundred and ninety-nine accidents reported for the six months previous to the 31st October, 1863. Thirty-six of these ended in death. Sir J. Elphinstone showed the other day to the House of Commons that nearly one thousand English lives were lost at sea in 1862; and it has been at last found necessary to subject the anchors and chain cables of merchant-vessels to an official test. According to the necessarily imperfect returns from the Manchester Association for the Prevention of Boiler Explosions, seventy-six people were killed and eighty injured last year by the explosions of steam-boilers in England. This death-roll could be yet lengthened by many unrecorded disasters. But the fallen are soon forgotten; the ranks of labour quickly

close up. The poor have no fees for compensation suits. Yet these figures, confessedly incomplete, speak for themselves to tell us that a happy medium between an undue legislative interference on the one hand, and an appalling destruction of life on the other, is one of the wants of the time.

XVIII.—*On Storing Turnips, Mangold, Potatoes, and Carrots* By GEORGE JONAS.

PRIZE ESSAY.

THIS Essay is intended to embody the results of practical experience, derived from the management of about 700 acres of roots, grown annually under my superintendence. The chief points to be observed for ensuring success in storing are, first, to select dry and fine weather for the operation, and never, under any circumstances, to cart or store any which are the least frost-bitten; to cover up and keep them dry when carted, but never so closely covered as to prevent the escape of any slight heat arising from the heaps and clamps when first stored; to be exceedingly watchful in the spring, as soon as vegetation commences, to uncover the top or ridges of the stored roots, so as to allow the escape of any heat arising from their sprouting.

The general time for beginning this work is the middle or latter part of October, and it is not generally completed till the latter part of November, or in some mild seasons until the beginning of December. Fine weather not only ensures the safety of the crop, but allows of the roots being laid in larger heaps, and in great measure protects the land from the injury caused by carting.

On heavy lands, ill suited for sheep, the whole of the turnip crop is drawn for stall-feeding; but on light sheep farms, the general and best plan is to remove about one-fourth or one-fifth according to the crop, taking five rows and leaving fifteen or twenty, or doubling these numbers. By this means the whole of the land is folded regularly, and turnips enough for the cattle [illegible] procured without exhausting the land.

The turnips required for immediate consumption in the [illegible]s should be drawn off, well cleaned and topped, then carted and stored in houses or sheds about the latter part of October. If the sheds be open, they should be covered with [illegible] to protect them from the frost. All the turnips that are to be consumed in the yards should be carried home and secured [illegible] the frost sets in; therefore, where there is not sufficient [illegible] hey ma[illegible] well in large heaps, on the

h side of walls or buildings, care being taken in the latter that there is troughing to protect the heap from the dripping s. The base wall is formed by two rows of hurdles, set about et apart, the space between them being well stuffed with ey-straw or some short pulse to keep out the frost. The ips are laid up to the top of the hurdles and piled up against wall, the heap being covered with a thick coat of straw from hurdles to the top of the slope.

his winter about 100 loads, carted in fine weather, and laid against a barn in this way, kept in capital condition, and e was not a bushel of decayed turnips in the whole heap. s a good plan to put a little straw at the bottom of the heap, eep the roots from the ground. Another plan is to lay them n long heaps of a triangular shape, about 8 feet wide at the and 6 feet high, covering them over first with straw, then with a slight layer of earth, but leaving the ridge out any earth on.

Vhen stored in either of the above ways, the turnips should leaned, and the crown or neck cut off close to the turnip, so prevent their sprouting; if not thus treated they will begin egetate, which causes them to heat and decay very quickly. y will keep good till the end of February when properly ed. If it is required to keep them till March or April, should be laid up in heaps from 15 to 20 yards long, about et high and 3½ feet wide at the base, tapering to the top, covered with earth as a protection from the frost: the tops is case are cut off, but the roots and earth hanging to them on.

he cleaning the turnips for carting home is done by women, cost of 4*s.* or 5*s.* per acre, or by a gang of children, having n to superintend them. For this purpose they use a knife or per, with which they remove all the earth from the turnip cut off the tops, throwing the roots in heaps ready for ng, as they are cleaned. All that are left in heaps in the at night should be covered up with the leaves, to protect from the weather.

he cost of filling into carts for carrying home would be about er acre.

urnips are stored in a variety of ways for consumption in the . When they are to be cut for sheep, they should be laid in s of about 30 bushels, with a little haulm or straw put on, over this a covering of earth; a little piece of straw being uncovered at the top to let any heat escape. All that are ded for use before the end of January should be cleaned and leaves cut off before they are heaped up; but those for later ing should be laid in heaps of about 10 or 12 bushels without

being cleaned, as the earth thus left on tends to keep them fresher and in better condition. No straw is then used, a covering of 4 or 5 inches of earth alone being required.

The work of cleaning and throwing into heaps of about 3 bushels ready for covering up is done by women and childre at a cost of from 4*s.* to 5*s.* per acre. The covering up wi straw or haulm and earthing over will cost about 1*s.* 6*d.* per ac Those that are heaped without being cleaned will cost abo 1*s.* 6*d.* per acre to pull up and throw in heaps, and about 2*s.* p acre to cover over with earth.

Another plan of storing turnips is to lay them in a furrow a plough them in. This is done by ploughing out two deep fu rows up the centre of eight rows, the two centre rows being fi pulled and laid aside; the turnips are then pulled up by t children and handed to a man (who stands between the to be placed in the furrow tops upwards; another furrow then turned on to them on each side of the row, covering th up to the necks: 2*s.* 6*d.* an acre will be a fair price for pulli and placing in the furrows. Turnips will stand almost a amount of frost when stored in this way, and are much bet than those left in the ground, even if they have escaped the fro besides they do not draw the land.

Another plan is to pack the turnips in round patches, putti three or four loads in each patch. This is done by beginning the centre to set them up with the tops uppermost, packi them close to each other till the patch is the required size, t leaves and all the soil hanging to the roots being left on; t outside row should be covered up to the neck with earth, and very severe weather a little straw should be thrown over the t This plan is best adapted for storing roots on the stubble-la for spring consumption, so that the turnip-land can be got rea for the barley crop.

MANGOLD.

The general time for storing this crop is the latter part October or the beginning of November, according to the seas If left later they are liable to be injured by the frost.

In taking up the crop the roots should be pulled up—c being taken not to bruise them by kicking them up—the lea cut or twisted off, and the roots either thrown in heaps or load at once into carts. Twisting the leaves off is much better th cutting them off, as the mangold are liable to get injured by t careless use of the knife; if the crown is cut, they very oft decay.

Mangold left in the ground will stand a frost, if not very seve as their leaves protect them; but when they are pulled a ve

little frost will injure them, therefore all the heaps left in the field at night should be covered up with the leaves.

They are best stored in long heaps of a triangular shape, about 6 feet wide at the base and 4 feet high. These heaps should receive an even coat of haulm or straw, about 12 inches thick, and about three or four days afterwards they should have a covering of earth of about 8 or 10 inches thick, taken from a trench made on either side: bunches of straw should be left, about 4 feet apart, sticking out at the top of the ridge to let out the heat. If this precaution is not taken, the roots will often decay from heating.

These heaps, or clamps as they are sometimes called, should be placed in some convenient spot close to the yards, and those that are to be consumed in the field by sheep should be placed on the headland of the field where rye-grass, rye, and tares, or some other spring feed is sown. This will save much labour in carting them a second time.

The wringing the tops off and throwing the roots in heaps ready for carting is sometimes done by day-work with children, having a man to superintend them, at a cost of 4*s.* 6*d.* per acre; the filling into carts and clamping will cost from 2*s.* to 2*s.* 6*d.* per acre. When the work is done entirely by men, it may be taken as piece-work at 6*s.* or 6*s.* 6*d.* per acre, according to the crop; this includes pulling and wringing the tops off, and filling into carts. The horse is, in this case, led up the centre of each six rows, so that the wheels will span the two centre rows; three men follow each cart, taking two rows each; one man will clamp (or stack) them as fast as six men can top and fill. The cost of horse-labour will depend upon the distance the roots are carried; one-horse carts should always be used, if possible, as there is no loss of time in changing the trace-horse; boys are generally employed to drive away. The covering with earth, if done by piece-work, costs 10*d.* to 1*s.* per rod in length—that is, for digging the earth and covering up; but the cheaper plan is to plough about eight furrows on each side the clamp as deep as possible, turning them to the heap; the furrows are then laid on with a fork or spade, and the loose moulds put on with a shovel to fill up the spaces left by the clods; this will cover each side of the heap within about two feet of the top; they should be left in this state for a few days to let out the heat, then a few more furrows should be ploughed in the bottom of the trenches, and thrown on to complete the covering to the top—bunches of straw or haulm being still left at intervals, as before mentioned, for ventilation.

The heaps should be partially uncovered in March, about two feet of earth being taken off the top, and at intervals of four or

five yards a space four feet wide should be uncovered down to the bottom; this is done to let out the heat caused about this time by the sprouting of the roots: if this heat cannot escape, they will soon decay. Mangold so stored will keep till July.

Potatoes.

The middle or end of October is the time for harvesting this crop, except the early sorts, which are begun in the latter part of September, and are taken up as required to supply the demand. As soon as the haulm has withered and begun to decay, the roots may be taken up and placed in houses, being laid in heaps, with straw or boards between them to separate the different sorts.

The first part of the process is, to pull up by hand the whole of the haulm or stalks, and lay them in bundles on the ground ready for burning, or carting into the yards; any potatoes that come up on the stems may be shaken off and left upon the ground; by this means, the land is cleared ready for the diggers to follow. Each digger with his fork takes one ridge, women and children act as pickers.

Potatoes are also ploughed out with a double mould-board plough, every other row being done alternately, so as to prevent covering up with the plough. After all the ridges have been ploughed, and the potatoes picked up, a light harrow is passed over the field, to bring any that may be left to the surface, so that they may be found by the pickers.

The work, if done entirely by hand—that is, the mere raising the potatoes with forks, and the women and children picking them up and putting them into sacks or carts—will cost from 21*s.* to 24*s.* per acre; but with the double plough the work is much facilitated, and its cost reduced. The ploughing will come to from 4*s.* or 5*s.*, and the picking to 6*s.* or 7*s.* per acre; so that the entire cost is reduced by more than half.

The two evils to guard against in storing potatoes (as in other root-crops) are fermentation and premature germination. If the former takes place, the tubers very soon decay; and if the latter, they not only lose much of their goodness as food, but are weakened for use as sets, since all the shoots have to be broken off before planting. To prevent this, it is of the utmost importance to have the tubers perfectly dry before they are stored for the winter.

Therefore, in the first place, fine weather should be selected ... the work; when taken up, they should be put into she... ... and left for two or three days, then turned over a... ... small or unsound roots being picked out for the cat... ... Those selected and reserved for sale should when p...

rly dry, be taken to the pits, where they are to be kept for the nter.

These pits or "pies," as they are sometimes called, are made removing all the top-soil to the depth of about a spit and half: some good dry wheat-straw is then laid in the bottom, ıd at the side, and the potatoes are then put in, and are heaped › above the surface, as high as they will lie, so as to make the des as nearly upright as possible, the pressure of the earth ›ing thus diminished; a thick coat of well-drawn dry wheat-raw is then laid over them, and on this is placed a complete ›vering of earth about six inches thick. From two to three ıns will be sufficient to put into each pit. On clay-lands the ›aps are generally placed on the surface for the sake of dry-›ss.

Some persons prefer storing the potatoes in houses made ıtirely for the purpose. Doubtless this is the best plan where can be done, as the store can be looked over at any time during ıe winter, when the shoots that have begun to sprout may be ıbbed off, and decayed tubers may be removed.

Carrots.

Carrots are usually harvested in the beginning of November; ry weather being selected for the work. They are usually fted by men or women, with a fork or spoon-shaped spade light ıough to be used with one hand, so that the other hand may › applied to the tops of the carrots. Great care should be ken to prevent the roots breaking off in the ground: when ised they are laid in rows far enough apart to allow a cart to ıss between them, and the tops are cut or twisted off by children. hey should be left in the field a few hours to dry before ›ing carted home, where they should be laid in long heaps ›out 3½ feet wide at the base and 2½ feet high, which, like the angold store, should taper to the top, and receive a covering of raw and earth.

In spring the heaps of unconsumed carrots should be looked ver, the decayed roots picked out, and the shoots rubbed from ıe sound ones; if they are required for late use, the crown ıould be cut off completely. After being looked over, the ›ots are heaped as before, but only covered with straw. Carrots re also stored in sheds, and covered over with straw. The ›st of taking up carrots varies very much, according to the ıode in which they are grown; the old plan was to sow them roadcast, but they are now commonly drilled, and the carrots re readily forked up when in rows.

For a crop sown broadcast the cost of taking up, topping,

and laying in rows, would be from 18*s.* to 20*s.*, but when drilled about 13*s.* per acre; the filling into carts is generally done by day-work at a cost of 3*s.* per acre, the unloading and stacking in heaps at about 1*s.* per acre. When stored in sheds the cost of stacking would not be so much; covering the heaps with straw and earth will cost about 5*d.* per rod if the heaps be ploughed round the same as for mangold.

XIX.—*The Improved Construction of Stables.* By P. H. Frere.

The Commission appointed to consider the improvement of our Barracks and Hospitals has this year published a Report on the Ventilation of Cavalry Stables, which contains suggestions that may be profitable to the Agricultural community.

As formerly disregard, if not wilful neglect, of the sanitary requirements of the horse was, perhaps, displayed in its strongest colours under military routine, so the influence of systematic management in our army may now lead the way in the path of improvement.

The old rule for the construction of cavalry barracks seems to have been that the men should be housed over the horses; the buildings were erected in solid blocks, the longer front being made up of the ends of the several adjacent stables; the party-walls—the roofs, with their ridges and gutters—and also the line of stalls, all ran *transversely* to a width of about 45 feet; so that some eight stalls were placed in a row, of which the two outer alone derived air and light directly from the window placed at either end of each compartment. The rooms above hindered ventilation through the roof, and air-shafts, if adopted at all, offered but an imperfect remedy. The horses generally stood in a double row, heel to heel, with a single path up the centre.

Farm-stables half a century old often exhibit the same principles of construction, roof-ventilation being in them quite neglected, even if the building has only one story.

The defects of this arrangement are clearly indicated by the following recommendations of the Commission:—

1. That the old transverse arrangement of stable be discontinued.

2. That in future all troop-stables be built with open roofs and ridge-ventilation from end to end.

3. That the roofs be partially and sufficiently glazed, to afford plenty of light.

4. That in so far as concerns facility of ventilation and supervision the open-roofed stable, having a central passage 14 feet i

idth between the stalls, is preferable to the open-roofed stable ith a centre division-wall, and two passages each of half that idth.

5. That besides ridge-ventilation and light, each stall should e provided with a swing window over the horse, and a row of erforated bricks should be carried round the stable under the eaves.

6. That each stall should have a supply of fresh air introduced n the space between the stalls, about six inches from the ground, hrough perforated bricks.

7. That improved impervious paving be introduced.

8. That all drainage within the stable be carried away in shallow impervious open drains by a rapid slope to the outside of the stable. Covered drains and cess-pits within stables or near the stable-walls being discontinued.

In order that these principles of construction may be better understood, the model-plan given on the next page accompanies the Report.

A few remarks, chiefly taken from the body of the Report, will further explain this subject.

Recommendation No. 2. As to the open roof. Since no suggestion is made as to the covering of the roof with slate or otherwise, the question of partially lining or ceiling between the rafters is not touched upon; the Report is in this respect somewhat defective.

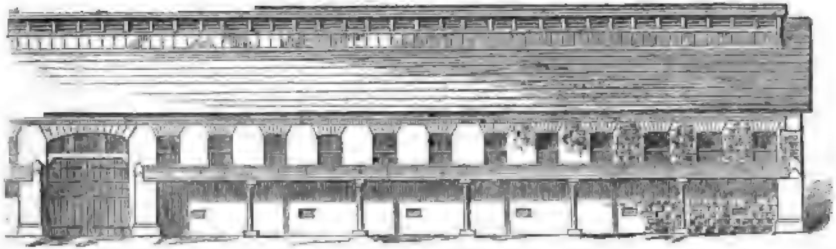
No. 3. It is suggested that the light be admitted on the northern side of the ridge.

No. 4. The farmer is often peculiarly circumstanced as to the contour of his buildings, which are designed not only to house certain animals, but to form enclosures for others which run loose in yards; moreover, his team is differently organized from the cavalry *troop*, and the less each set of carters and horses is interfered with the better. In neither respect will the double row of stalls generally suit his purpose. Such an arrangement generally economises walls, but necessitates a more costly, because broader, roof.

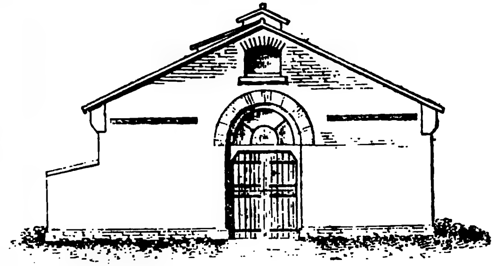
No. 5. The Report further suggests that an improved air-brick, "with a louver to throw the air upwards," is a desideratum in stable-ventilation for the course placed under the eaves; on the other hand, the air-bricks inserted just above the ground-level should throw the air-current downwards to the floor. Whether these air-bricks be made of iron or of brick-earth, the trade will, no doubt, with a little encouragement readily meet this requirement.

No. 6. It is elsewhere stated that the area of the holes which admit fresh air in the space between the stalls above the floor should be equal to that of two or three ordinary air-bricks.

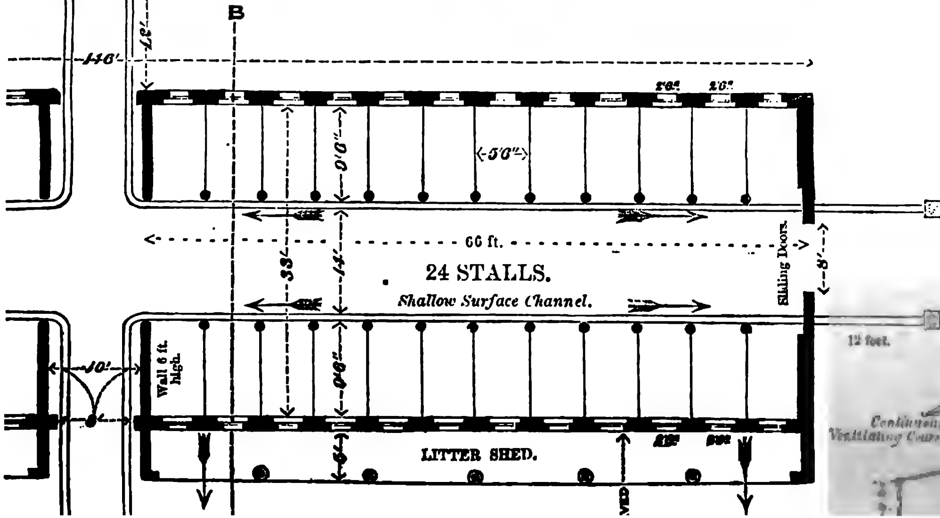
PLAN A.—SHOWING THE CENTRE AND ONE WING OF MODEL STABLES FOR FORTY-EIGHT HORSES.



Side Elevation.

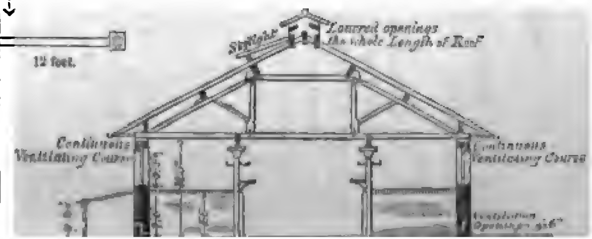


End Elevation.



10 5 0 10 20 30

Scale of feet for Ground Plan.



No. 7. The question of paving involves the following principles:—

Paving should wear well, not become slippery; be watertight; be easily cleansed.

No. 8. The objection to cess-pits extends to all sewers or covered drains within stables, which are merely cess-pits of another form.

The drains, like the stable floors, should be impervious to moisture. Cobble-stones and paving-stones should never be used for forming stable-gutters; these should be made of smooth material, with as few joints as possible, carefully laid, having a shallow saucer-shaped section, and with as rapid an incline as it is possible to obtain. . . . . .

These gutters should discharge into an underground-drain (which should be a drain-pipe), at a distance of at least 12 feet from the stable-wall. As the surface-drains always receive a considerable quantity of dung, besides urine and water, it would be advantageous to provide a trap at the openings of the underground-drain to prevent effluvia returning, and to avoid stoppages.

To mend old Stables.—Besides the directions here given for the erection of new buildings, the Report offers suggestions for the improvement of existing stables. Those arranged on the old transverse construction should have shafts for the removal of foul air carried from the ceiling to above the roof. The middle of the length of the stable is the best place for such shafts, although the corners may be more ready of access. "Their conjoint area should be equal to 18 square inches per horse at the least."

Fresh air may be admitted by openings close to the ceiling

Explanation of the Plan.

The plan is that of a stable for 48 horses under a single roof. The interior length of the building is 143 feet 8 inches, and the breadth 33 feet. The height of the side-walls to the spring of the roof is 12 feet, and the total height is 20 feet 6 inches. Each horse will thus have 1605 cubic feet and about 100 superficial feet of space. There is a door opening in halves and two windows at each opposite end, and a door opening in halves on each opposite side. The stalls are of the usual width of 5 feet 6 inches, and there is a central passage 14 feet wide between the opposite stalls.

This stable is ventilated by a louver 16 inches wide carried from end to end of the roof, affording about 4 square feet of ventilating outlet for each horse.

To ensure a continuous movement of the air in the stable at all times, a course of air-bricks is carried round at the eaves; the whole affording a fresh-air inlet of one square foot per horse, and an open space is left under all the doors for the same object. When a larger amount of ventilation is required, it can be afforded by opening a sufficient number of swing windows, of which one is provided for each stall. These windows are 3 feet 3 inches high, by 2 feet 6 inches wide. To ensure a movement of the air near the horse's head when he is lying down, an air-brick is introduced between every two stalls.

at each end of the stable. Each shaft or inlet should be provided with a louver or "spreader" within the stable, to prevent occasional down-draughts. As many air-bricks as possible should be introduced at the ends, close to the ceiling.

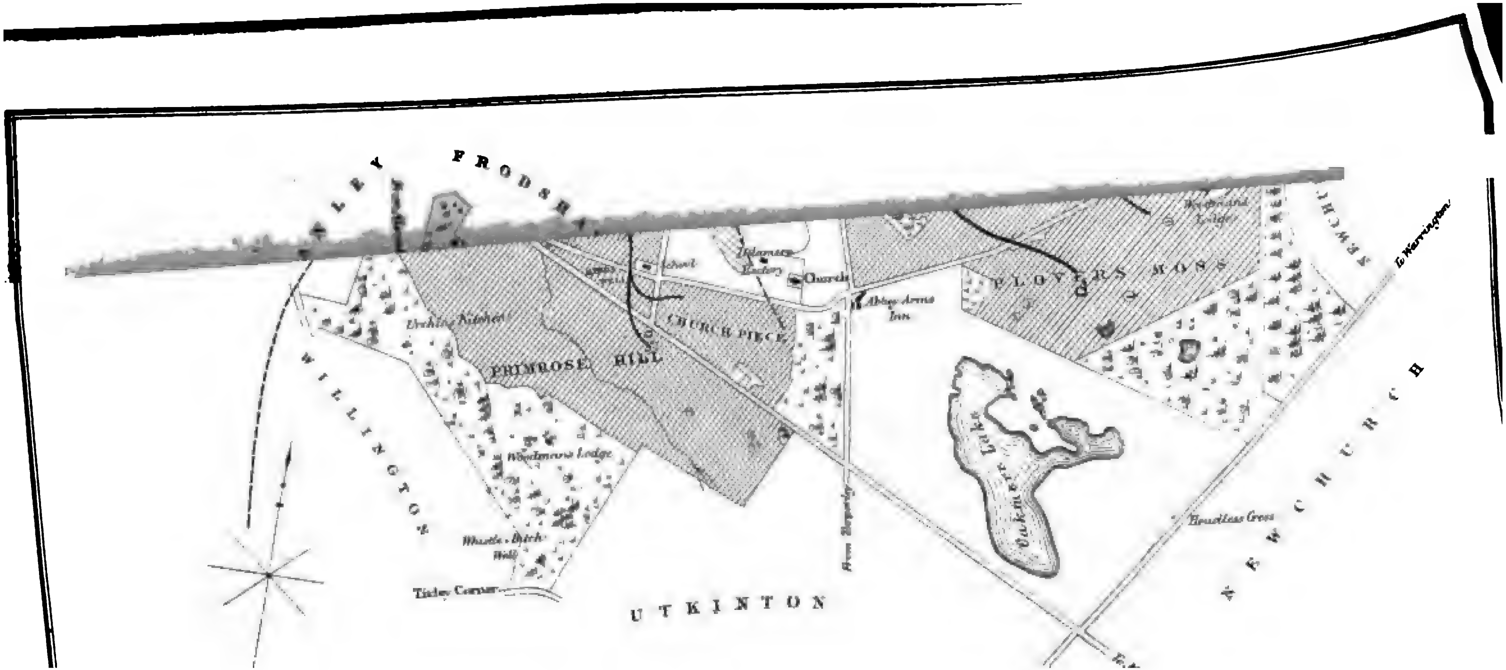
To supply air to the horses while lying down, a hollow iron-shaft may be carried all the way across the stable, from outside to outside, under the cribs, so as to fit into the angle made by the transverse wall and the floor. In this shaft holes will be made at the corner of each stall. This arrangement will be available when horses stand in double rows, heel to heel; it may be adjusted also to other plans.

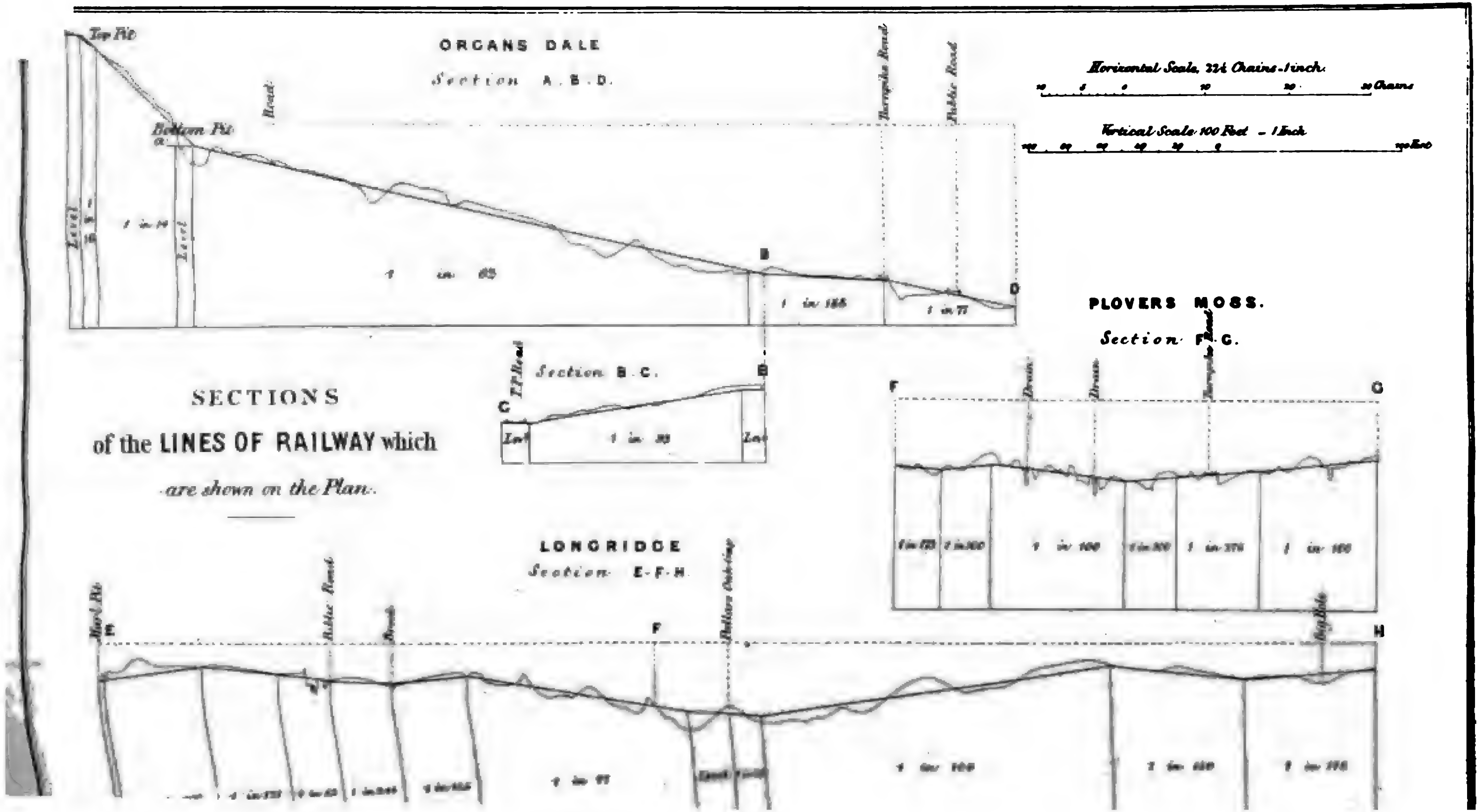
When it is in contemplation to provide stable accommodation for cart-horses in stalls amounting to 100 square feet superficial and 1600 cubic feet for each horse, the question arises—whether a single step further would not serviceably provide each horse with a box? With judicious management and a moderate supply of straw, the utmost comfort of the horse may thus be combined with the best economy of manure.

When I last visited Mr. Lawes's farm at Rothamsted, the cart-stabling struck me as almost perfect, though obtained by the conversion of a wide, old, boarded cart-lodge into horse-boxes in a homely style, and at very moderate expense.

These boxes, 10 in number, form a double row, with a raised walk 4 feet 6 inches wide down the centre. A shed at one end acts as a store for hay and straw, and likewise holds the chief part of the harness; the rest is suspended in the stalls. Stout iron rods are used for the sides of the boxes; the wooden pillars, which form two corners of each box and range along the central path on either hand, afford a great stay and support to the old defective roof; each horse has his own rough door opening to the outside, so that he never disturbs his neighbours. The building is detached from the yards, so that one objection connected with stables opening inwards on farm-premises does not here arise; viz., the horses when they go in and out for work or water do not disturb any other stock in the yard. There is louver boarding over each door, and when the horses are at work the doors are set open and the building is thoroughly aired. The litter on the top was clean, the air sweet, without a trace of ammoniacal gases; yet, when Mr. Lawes called for a fork and stirred the bedding from beneath, a moist mass appeared reeking with the richest vapours.

I have seen of late spacious costly halls for stabling cart-nags, where neither the ventilation, the standing, nor the appliances for making and removing manure were half as satisfactory as those of Mr. Lawes.


LEY
FRODSH
WILLINGTON
PRIMROSE HILL
CHURCH PIECE
PLOVERS MOSS
Urchins Kitchen
Woodmrows Lodge
Whistle Birch Well
Tinley Corner
School
Church
Abbey Arms Inn
From Beeperley
Oakmere Lake
UTKINTON
Headless Cross
NEWCHURCH
NEWCHU
To Warrington
Lodge


SECTIONS
of the LINES OF RAILWAY which
are shown on the Plan.
ORGANS DALE
Section A. B. D.
Top Pit
Bottom Pit
Road
Turnpike Road
Public Road
Level
Horizontal Scale, 22½ Chains - 1 inch.
Vertical Scale 100 Feet - 1 Inch
PLOVERS MOSS.
Section F. G.
Drain
Drain
Turnpike Road
Section B. C.
T.P. Road
LONGRIDGE
Section E - F - H
Public Road
Brook
F
H

—A Description of the Works for Reclaiming and Marling ts of the late Forest of Delamere, in the County of Cheshire. RICHARD B. GRANTHAM, Civil Engineer and F.G.S.

woodland is situated between the towns of Chester and ıwich, being distant about ten miles from the former and miles from the latter. The turnpike-road between the two ı runs through the property.

.e estate contains 4023 acres, in the possession of the Crown ›odland, beside Old and New Pale Farms, containing in all .cres, which were reclaimed and brought into cultivation at ıtter end of last century, under a lease from the Crown.

.e entire district belongs geologically to the new red sand-formation, and the forest is on the white sandstone (Keüper) ed marl strata of that formation.

e following is an extract from the memoir attached to the ance map, which is geologically coloured :—

ı Longley Hill the beds dip east at 9°, and in the valley, which is :ably straight, there is a fault with a slight down-throw on the west, changes the dip. On the top of the hill at Heald there is a small out-red marl shown in some marl-pits, the dip being west at 4°. Beyond c beds roll over and dip towards the base of Eddisbury Hill, bringing in . marl, which may be seen in some pits close to the fault, which ranges ınd south along the western base of the hill. This fault produces a very l feature, and has a down-throw on the west of about 400 feet.

.disbury Hill reaches an elevation of 583 feet, and from its summit a ne view may be obtained of the Delamere Hills to the north, and of the l plains which extend eastward and northwards from its base. The top hill is composed of flags and shales belonging to the highest beds of the stories. The dip is east at 12°, and the red marl is brought in by a vest fault, which traverses the centre of the hill west of the camp.

should be stated that the greater portion of the Cheshire plain is deeply :ead with drift, which renders the geology very obscure." *

e marl lies in detached spots, and in one part forms a long stretching towards Honslough, at the northern extremity of ›rest.

e irregular distorted nature of the beds (as well as the faults) ; how great were the forces by which the disruption was ›d.

is irregularity is in some degree an advantage to the estate, ne of the marl beds have thereby been rendered more easy :ess.

e surface soil of the estate consists of gravel and sand, ıte, and mixed with occasional beds of peat. The crop it consisted chiefly of oak, the residue being Scotch fir and

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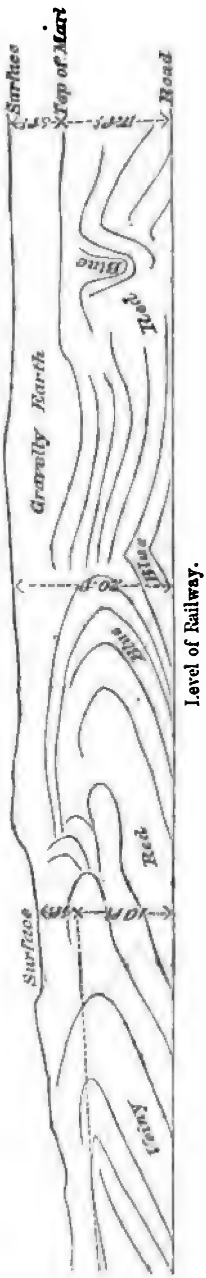
ıe Marl Beds are shown on the map accompanying this paper by broken g. The Faults are shown by strong dotted line (see reference on map).



SECTION OF MARL PIT AT HONSLOUGH.

larch, the whole of which was planted under the following circumstances:—By the Act 52 Geo. III., c. 136, passed in the year 1812, at which date there was a general feeling of alarm at the prospect of the failure in the supply of timber for the navy, the Commissioners of Woods were required to keep this estate (exclusive of the Old and New Pale Farms before referred to) as a nursery for wood and timber only, and for no other purpose whatever. Nearly two-thirds of the estate were planted in pursuance of the directions contained in that Act, but a considerable portion of the young crop did not thrive, and the Commissioners of Woods, in charge of the Royal forests and plantations, came to the conclusion that much of the land might be profitably converted into farms; and in 1856 an Act was obtained to empower the Commissioners to clear the land and to let it upon farming leases.

The improvements already effected upon the Old and New Pale Farms, held from the Crown under lease, were a guide for future action, and the portions of the estate that were least fit for the growth of timber and most suited for the application of marl were selected for clearing, and after careful inquiries had been made as to the best system to be adopted, the Commissioners directed Mr. Clutton to proceed with the reclamation.

The accompanying map shows the extent and limits of the Crown property, both woodland and in farms.

I now proceed to describe separately the works executed on the three portions of the woodland recently cleared, and let for cultivation.

First. *Honslough.*—The northern part of an allotment of Castle Hill, called Honslough, containing 248 acres, and lying on the marl, was the first taken in hand: the whole was cleared, grubbed, trenched, and marled. This land, like the rest of the estate

d chiefly of light sandy and gravelly soil, with some peat. face is tolerably level, except at the south end, where a in a low valley traverses it. The marl-pit is at the north part of the land (at Waterloo Gate), as shown on). Trial-shafts and borings were made to ascertain the ss of the earth overlying the marl, technically called or "rid," which was found to be very variable, as the urface of the marl undulated to a greater extent than that und above it.

ie first commencement of the operations at Honslough it med advisable that the work of excavating, carrying, and ig the marl should be performed by contract; the work isequently advertised, several tenders were received, and ement was entered into at the price of 8¾*d.* per cube d a commencement was made in February, 1860. When, , the contractor had brought a limited quantity of rails, s, horses, &c., on the land, and had marled about sixty became apparent that he could not continue the work at ce. The contract was therefore put an end to, and the as proceeded with under the charge of an engineer and endent, by whom it was completed in December, 1860.

modus operandi was this:—The fee was in the first carefully removed from the upper surface of the marl, ay here observe that it was subsequently disposed of by rown into the part of the pit from which the marl had cavated. The marl having been laid bare and opened, light form, fastened upon longitudinal sleepers, were o the pit at a low level, so as to arrive at the bottom marl bed. The average depth of marl was from 10 to the fee above it varying from 4 feet to 5 feet, or about quarter to one-half the depth of the marl. The marl beds atified and were very much distorted, as shown by the section, and their colour varied from a dark red to that it blue slate:—

following is an analysis of an average sample of the

ture	1·96
nic matter and water of combination	2·52
es of iron and alumina	14·21
onate of lime	8·65
nesia	1·39
phoric acid	·36
sh and soda	1·91
luble silicious matter	69·00

railway was 2 ft. 7 in. gauge, and the waggons, made on e tipping plan, contained about 1⅓ cube yards of marl, ighed about 1 ton 18 cwt. The waggons upon being

drawn out of the pit by horses were made up into trains and drawn away upon a main or straight road to a certain point from which branch lines diverged: the extreme distance to be traversed was about one mile. These branch lines consisted of rails fastened upon wooden sleepers made into frames about 14 feet in length, which were moved by two men or a horse so as to form parallel lines at such intervals as the prescribed dressing of marl rendered desirable.

The waggons being tipped on either side of the rails, and a load shot down at an interval of 5 yards, it was found that by laying the branch lines 12 yards apart a dressing of about 130 cube yards was applied to each acre. The marling varied in amount from 100 to 180 cube yards, and on the whole an average of 117 cube yards per acre was spread. On steep hill sides a windlass was used, by which the descending full waggons drew up the empty ones.

The total quantity of marl taken out and spread upon the 248 acres was 29,000 cube yards, at a total cost of 1797*l.*, being at the rate of 14·87*d.* per cube yard, and of 7*l.* 4*s.* 11*d.* per acre. This estimate includes every expense of marling, except the loss for depreciation of the plant and horses, and the cost of superintendence. The plant in use on Honslough was taken up from the contractor, and consisted of about 1200 yards of rails and planks, 30 waggons, 10 horses, besides barrows, planks, carts, &c. The land, which in its former state was not worth more than 5*s.* per acre, is now formed into one farm, and lets for 1*l.* 10*s.* per acre.

The farm buildings were subsequently constructed, for which, in addition to the above rent, interest is received on all the outlay required above 500*l.*

Second. *Longridge and Plovers Moss.*—It was next determined to clear, trench, and marl certain portions of Longridge and Plovers Moss; but the position and quality of the marl bed, the undulating nature of the ground, the great extent (800 acres) to be reclaimed and the distance to be traversed, required a different system of management. The surface-soil is of the same character as that before described, but peat mosses of varied size, on which Scotch firs are still left growing undisturbed, intervene.

With the view of completing the work in the shortest time and in the most economical manner, all circumstances being taken into consideration, I recommended that a small locomotive of 2 ft. 7 in. gauge should be employed, and the number of waggons increased to sixty. The best line for the railway from the marl pit was selected under the condition that it must be central, and be available for all parts of these lands; its direction and gra-

dients are shown by the plan and section. Stronger rails were procured for the locomotive line than had hitherto been used for the moveable roads, and they were fastened on longitudinal sleepers, consisting of deal planks; the line was formed by cuttings and embankments, so that the engine, with its train of waggons, started at the pit's mouth and ran as far as was convenient to the several points from which moveable rails diverged, over which the waggons were drawn by horses to distribute the loads. The longest distance which the locomotive ran was a mile and half, and the horses took on the waggons a distance of about half a mile further. In some cases the moveable rails had to traverse the sides of steep slopes, or to go up and down sharp inclines for short distances.

When one part was marled, the main road was taken up and laid in another direction. The system, as before practised at Honslough, was adopted of taking out the marl upon the moveable roads and tipping it in heaps, which were afterwards spread.

The engine drew twelve full waggons, weighing, including herself, about 33 tons, up the incline of 1 in 100, at the rate of four to five miles an hour, and took the empty ones back up 1 in 77 at six to eight miles an hour. (See sections E. F. H. and F.G.)

On reference to the plan it will be seen that the marl pit lies at some distance from the principal part of the land to be marled at E. in a valley at the east foot of Eddisbury Hill, and forming part of Old Pale Farm. The marl was of quite a different character from that before described, and had the appearance of dull red clay. It differs from the rock beds of the new red sandstone formation, which afford the marl in general use in the country, and is probably derived from the denudated marl beds and conveyed by water to an ancient valley. In composition it does not materially differ from the rock beds, as the following table will show:—

Moisture	1·55
Organic matter and water in combination	·85
Lime	5·76
Magnesia	2·11
Potash and soda calculated as chlorides	2·01
Carbonic acid and loss	7·71
Insoluble silicious matter	63·48
Oxides of iron and alumina and traces of phosphoric acid ..	16·53

When taken out upon the land in lumps and dried by exposure, it laminates like thin slate, and is easily mixed with the soil by ploughing and harrowing. The pit was from 15 to 20 feet deep below the ordinary surface of the land: this depth includes the bearing or fee as well as the bed of the marl, the latter being from 12 to 15 feet in thickness in the centre or deepest part,

thinning out on both sides. The fee was very carefully taken off the surface of the marl and thrown back into the place from whence the marl had been excavated. The waggon roads were laid into the bottom of the marl bed, which rested on sand and on a bed of large water-worn pebbles. The thickness of the fee was moderate and uniform, being about one-fourth to one-fifth of that of the marl.

The work of marling commenced in Longridge and Plovers Moss early in March, 1861, and was completed at the end of March, 1863, a period of exactly twenty-five months. The work proceeded at the average rate of about 32 acres per month; the largest quantity being 63 acres, and the least 18 acres, in one month. 87,228 cubic yards of marl were excavated and conveyed an average lead of two miles, and the quantity spread per acre was at the rate of about 110 cube yards, at a cost of 7890*l.*, being at the rate of 21·70*d.* per cube yard, and of 9*l.* 18*s.* per acre, exclusive of the loss upon the disposal of the plant, and the cost of superintendence.

The following table gives the cost of each portion of the work per cube yard:—

	d.
Removing fee and excavating marl	4·89
Spreading marl	1·32
Removing materials of, and making railway, laying rails, repairing and removing temporary roads, and tipping waggons	3·95
General work at the marl-pits	3·66
Carpenters' wages	·50
Blacksmiths' wages	·14
Feed of horses, horsekeepers and drivers, harness and repairs to ditto	4·01
Engine, including driver, cleaners, fuel, oil, &c., and repairs to ditto	1·94
Repairing waggons (materials)	·43
Carting materials for repairs	·23
Foremen, &c.	·33
	21·70

The plant employed on this portion consisted of the locomotive, 11 horses, 60 waggons, 2600 yards of engine rails, 2500 yards of moveable rails, barrows, planks, carts, &c. The repairs and renewals were all executed on the works, and were charged to Marling, as will be seen by the foregoing table. The number of men and boys employed was about seventy.

At the conclusion of the work all the rails, waggons, locomotive, &c., were removed to Organsdale and Primrose Hill allotments, which will be next described.

The whole of the 800 acres in Longridge and Plovers Moss could not have been considered worth more than 5*s.* per

:heir former state; they are now let in one farm at 32s. 6d.
ι

ıtable dwelling-house, cottages, and homestead have been and a new road made, for which interest is paid in ı to the rent.

ːond crop is now growing on the land, which, as well as ıer crop, has given satisfactory results.

l. *Organsdale, Primrose Hill, &c. Allotments.*—As the ıst described was drawing towards its completion the 'as gradually moved off to Organsdale, Primrose Hill, er allotments, which had been cleared of timber and . in readiness for the marling, which was commenced by n the Organsdale allotment in April, 1863, while the 'as under repair and the locomotive railway being laid down. narl bed in this case is situated on the high ground on : boundary of the property, as shown on the map and on .on A B D; A being the position of the upper pit, and lower pit. The marl nearly resembles that of Honslough, ;eneral position and dip are described in the early part ıaper, in which the geological character of the country is ɔf. Its thickness, both in the upper and lower pits, is feet, but that of the fee, which is composed chiefly of ries considerably. The following is an analysis of the

ture	2·22
ıic matter and water of combination	·69
ɜs of iron and alumina and traces of phosphoric acid ..	8·10
.. ..	2·84
ıesia	2·40
·h and soda calculated as chlorides	1·58
›nic acid and loss	4·33
uble silicious matter	77·84

;e proportion of the land in these allotments, of which 30 acres are in course of being marled, is of a better :han that before dealt with, therefore a less quantity of s considered necessary.

this date (the end of June, 1864) 464 acres have been ›y 45,902 cube yards, being at the rate of 99 cube yards at a cost of 4732*l.*, at the average rate of 10*l.* 3*s.* 11*d.* ;, and 24·74*d.* per cube yard. The rate at which the s proceeded is about 31 acres per month. The same ; been employed as in Longridge and Plovers Moss, and ' system of main and branch lines has been adopted. By to the section A B D, it will be seen that an inclined s adopted to bring the waggons from the upper pit to ıe station at the bottom, and by this means five loaded drew up as many empty ones. The waggons from the

lower pit were brought out to the engine station upon the level; when a train of twelve was formed, the engine started with them down a gradient, for nearly a mile, of 1 in 62, up which she returned with as many empty ones at the rate of six to eight miles an hour, and in this manner has frequently taken out from 140 to 150 waggons a day, containing about $1\frac{1}{3}$ cube yards each. The following table shows the cost of each portion of the work per cube yard:—

	d.
Removing fee and excavating marl	7·31
Spreading marl	1·35
Removing materials of, and making railway, laying rails, repairing and moving temporary roads, and tipping waggons	3·89
General work at the marl-pits	3·04
Carpenters' wages	·57
Blacksmiths' wages	·54
Feed of horses, horsekeepers and drivers, harness, and repairs to ditto	5·23
Engine, including driver, cleaners, fuel, oil, &c., and repairs to ditto	1·76
Repairing waggons (materials)	·14
Carting materials for repairs	·59
Foremen, &c.	·32
	24·74

The largest number of acres marled in one month to this time is 48, and the least 19. The latter was the quantity accomplished by horses when they were employed alone to convey the marl to the portions of the land nearest to the pits which were specially reserved for that object.

The last table shows that the average cost per cube yard of marl has increased in these allotments as compared with other places. This increase may be thus explained: the fee being composed chiefly of rock was excavated at a higher rate of payment; it also bore a larger proportion to the marl beneath than before, amounting to 40 per cent.

The slopes and inclinations of the surface of these lands are rather more uniform and less undulating and precipitous than in Longridge, and offered greater facilities for conveying the marl [illegible] spreading it.

The land that was selected to be cleared was not worth more than 7s. per acre; but the whole has been let at the rate of 33s. [illegible] acre.

A residence, cottages, and homestead are being erected and [illegible]s formed, for all of which interest is to be paid, in addition [illegible] the rent.

As much of the land as was available has been cropped with [illegible], which generally promise well.

eral Remarks.—Under any circumstances the cost of marl-
nd will vary widely, according to the position and extent
bed of marl and the facilities of transport. When the aid
amway is sought, undulations in the surface of the district,
er small or large, will tell heavily on the results obtainable.
amere Forest presents less favourable conditions for the
than many other tracts of waste land in the kingdom.
is no great choice of pits, and these are limited in extent
metimes covered with much useless earth; the state of the
market in the neighbourhood and the moist climate (for
rain interrupts the work) add materially to the cost of
g the marl, whilst the irregularities of the surface create
lties and increase the wear and tear to an extent which
t be easily computed.

the other hand, the proximity of important manufacturing
creates a large demand for vegetable produce, which gives
ial value to warm sandy soils when rendered capable of
ng such crops. The items both on the debtor and creditor
of the account are, therefore, unusually large, and we must
o the balance if we would judge of the results.

en if this be not so considerable as more favoured spots
present, still a good work is done if the area of cultivated
n this kingdom is increased in a manner consistent with
economy; and, above all, an example is set and, it may be
, an impulse is given by the Crown, which private land-
s may follow up to greater advantage by the light of the
ience already gained.

ch of the three cases described had its own peculiar con-
s calling for varied treatment. In Honslough the large
rtion of marl to fee—and that fee was easily moved—the
nature of the land, and the shortness of lead, tended to
down the cost; but the marling proceeded at a slow rate,
all done by horses, and the cost of management continued
r.

Longridge and Plovers Moss some of these conditions were
sed. The marl pit was nearly a quarter of a mile from
earest corner of the area, a large proportion of the leads
ded two miles, and to the north they attained a distance of
nd a half miles.

e engine line, though selected and constructed with great
had still an incline of 1 in 100 for nearly three quarters of
e; up which the load was to be drawn. Although here
ain was at times reduced to eight waggons, the power of
ngine was more severely taxed than has since been the
The horse, or branch lines were likewise carried over
ough and undulating land in almost all parts of the area.

Parts of Plovers Moss were not so rough, but the waggons had to traverse soft peaty land. The engine line had to be laid with cuttings and embankments of some extent, that the higher lands might be reached. If the work of excavation was here comparatively easy, on the other hand it was very difficult to tip this stiff clay out of the waggons, which were frequently pulled over by their load in wet weather.

In spite of all the difficulties, the whole of the 800 acres included in the second farm, were completed in twenty-five months, or at the rate of 32 acres per month, and the farm was made over to the tenant. By these vigorous measures one year at least was gained in rendering the land available for letting. The inspection, without being costly, was very efficient, providing for the careful selection and even distribution of the marl, so that the work was thoroughly well done.

In the Organsdale and Primrose Hill allotments the cost of getting the marl was increased by the thickness of the fee; but the land lay well for conveyance and spreading. Here, as in the last case, a rent accrued the earlier in consequence of the rapidity with which the work was despatched, and there was a corresponding saving of interest on the previous expenditure for grubbing and trenching the land.

I have seen in the neighbourhood some small areas in the course of being marled by horse and cart, and in some instances I have remarked that much earth and fee were mixed with the marl. The existence of old marl pits, such as that at Old Pale Farm, shows that a large quantity of land in this part of Cheshire was formerly reclaimed. None of these pits, however, are of sufficient size to have furnished marl for a large extent of land.

The greater part of the plant, including the rails, sleepers, and nearly all the waggons, will, after having been used on 1600 acres, be serviceable for the same purpose again. With the engine we fortunately never had an accident, and the only repairs done to her were rendered necessary by hard work.

The land nearest the pits was always left to be marled by horses in case the engine was disabled; but I always found the engine could do twice as much work in a given time as the horses, and at about half the cost as shown by the tables.

In the few districts where marl or clay underlies the surface at the depth of one or two yards, it may be raised from the subsoil, and no plant is necessary; but if it lie at any greater depth the clay must be brought from a pit opened at some distance; in that case, rails laid on longitudinal sleepers and engines to draw the waggons are the cheapest and quickest machinery for accomplishing the object in view, particularly if the land is wet and soft.

ı a roadway has been provided with due regard to in- n and direction, the engine-tracks may often be made e afterwards for farm-roads; such has been the result at ›re in nearly every case where cuttings and embankments ·en made for the tramway.

w remarks may not be inappropriate here upon the several ·hich make up the average cost per cube yard of marl as shown by the tables.

›mparing the expense of horse labour with that of the as shown in the table, it should not be overlooked that ıorses were employed at Delamere they did not, on an ', convey the marl more than one-third of the distance ›d by the locomotive; at the same time it should be that the horse-line was occasionally more rugged and than that of the engine. The locomotive in good weather m 140 to 150 waggons per day. It could have taken a number, but that its efficiency was restricted by the · of waggons, namely 60, of which five or six were always ·epair. It was not thought expedient to have a larger f them, from the uncertainty whether, though still service- ey could be disposed of advantageously when the work be finished.

:her important and interesting question connected with bject is the duration of the efficiency of the marl. The nce gained by long and extensive practice in Cheshire ›s that where marling has been properly done, one appli- has sufficed to furnish an adequate supply of mineral ›rs, and also to consolidate sandy lands. To quote an e which has come under our own observation, the Old ›w Pale Farms were reclaimed by marling at the latter ast century, and are still profitable good farms. The same said of some thousands of acres elsewhere. There is no but that the marl acted at first for several years, both ally and mechanically; after a while all traces of it dis- ›d, but not until by constant cultivation a more productive l by degrees been created. The Old Pale Farm has been marled a second time.

H. S. Thompson concludes his excellent paper on 'Agri- l Progress' in the last number of the Journal, by regretting : had not time to complete his programme by touching jects of great interest, among which he alludes to the or marling of light lands, and the connection of railways griculture, he also states the great difficulty that exists in ng any authentic statistics relating to agriculture. The hopes that the above description of the marling of parts

of Delamere Forest will furnish some information upon a subject that is of growing importance; and he ventures further to express his hope that Mr. Thompson will, as he promises, carry the matter farther, and point out to scientific men practically connected with agriculture how they may lend their aid, not only by effecting improvements on a large scale, but by systematically placing on record the results of their experience.

Supplement to Mr. Grantham's Paper on the Reclaiming part of Delamere Forest. By P. H. Frere.

The account of this important addition to our area of cultivated ground would be incomplete without some outline of the results subsequently obtained in farming this land. To supply this defect, Mr. Leather, the lessee under the Crown, whose acquaintance I made in my hasty visit to this spot, has obligingly furnished me with the following particulars.

Of the newly marled land a large part was at once cropped with potatoes and with turnips, and gave very satisfactory results.

In the year 1862, 100 acres were planted with potatoes, with a dressing of 4 cwts. of Peruvian guano. The crop, though varying from nearly 10 tons to 3 or 4 tons per acre, was good on the whole, and averaged 6 tons per acre, the marketable potatoes realised 4*l.* per ton; the residue furnished 30 lbs. per day to 32 horses during 6 months. The sales realised in all 1950*l.*

Sixty acres of roots were also sown, of which 6 were swede, the rest white turnips; the manure supplied was, of bone dust 5 cwts., Peruvian guano 2 cwts., salt 5 cwts. per acre. The crop was satisfactory; an acre of it, on the average, carried 290 sheep for one week.

In the following season, 1863, the 100 acres which had already borne potatoes were sown with turnips, of which 70 acres were swede, the rest white.

Sixty acres were manured as follows:—bone-dust 7 cwts., salt 7 cwts., Lawson's nitrophosphate 2 cwts. The other 40 acres had bone-dust 5 cwts, salt 5 cwts, nitrophosphate 2 cwts. The crop was very heavy, and fed 1790 sheep from October till they were sold fat in spring (the last going out in June), besides keeping 6 bullocks, and supplying 28 lbs. per day to 32 horses for two months. Of these roots only one-third were consumed on the land whereon they grew, those that were drawn enabled Mr. Leather to fold 200 acres more of land. The sheep received [illegible]f, 1 part hay to 2 [illegible] straw; the entire cost of their artificial [illegible] amounted to 11s. [illegible] head.

3arley and oats followed in 1864, of which the former is esti- ted at 35 bushels, the latter at 50 bushels per acre. The ver which is sown with this spring corn promises to become a st class crop.

Tempted by the success of his first venture as a potato grower, r. Leather was induced in 1863 to set 300 acres. At first all s full of promise, but the rainy autumn season in Cheshire, sease in the tubers, and the state of the markets combined to ow the hazardous nature of this branch of agricultural enterprise. ie crop itself was large, so large that the storing and the extra rting necessitated by disease became very costly, and after all bulk of the crop had to be applied to pig feeding on a very ge scale. But these mishaps are apart from the question of tility and capabilities which we have been considering.

The following is a general outline of the scheme of manage- nt which Mr. Leather proposes to himself for his future idance :—

Plan for Cropping Delamere Lodge Farm.

; acres, first year grass, 75 mown for hay.
; ,, second year grass, eaten off by hoggets, ewes, or lambs.
; ,, third year grass, 75 acres to be ploughed by Hancock's plough, and sown on flat with swedes or turnips as soon as the land can be spared.
; ,, corn; 25 acres of this stubble in winter tares.
; ,, fallow crops, viz.: 50 acres in potatoes, to be cleared off ground in time for rape or turnips; 50 acres in swedes, and 25 in swedes or turnips, as the tares are consumed.
; ,, corn, sown out with grass-seeds and clover.

N.B.)—The yard-manure to be applied to the corn-stubble of the fallow ak, as long dung in autumn, or as short dung in spring.

Mr. Leather intends to keep a large flock of half-bred Cheviot d Leicester ewes—to be put to a strong Lincoln ram—and to ten the produce at the age of twelve to fifteen months.

The ewes will be put on white turnips in September, and, as y take the ram, be removed on to grass, receiving there an owance of hay and straw chaff, with a small quantity of rape cotton cake if required. Before lambing time the turnips ll again be stocked, and the supply of cake increased. The nbs from the time of weaning will receive corn or cake in adually increasing quantities, so as to average in summer $\frac{1}{4}$ lb., the autumn $\frac{1}{2}$, in the following spring 1 lb. per head.

XXI.—*Statistics of Live Stock and Dead Meat for Consumption in the Metropolis.* By ROBERT HERBERT.

NOTWITHSTANDING that increased supplies of beasts were on sale in the Metropolitan cattle market during the first six months of 1864, and that the imports from abroad were on a liberal scale, the prices of beef, allowing for usual fluctuations, were well supported. The arrivals from Norfolk, Suffolk, &c., showed a slight decrease in number, those of the previous season, having amounted to 62,170 Scots, crosses, and short-horns, against 66,940 head in the corresponding period in 1863; but their quality was remarkably fine. Hence the majority of the beasts realised as much as 4*s.* 10*d.* per 8 lbs., and the Scots and crosses carried a full average quantity of internal fat. The losses from disease have, it is understood, been trifling, and our impression is that stock, generally, was never in a more healthy state than at present. From Scotland the supply of beasts was large, viz., 9918 head against 9610 head last year. The supply was, perhaps, of the finest quality ever known. Some very good beasts came to hand from Herefordshire and Devonshire, and sold well. The receipts from Ireland were moderately extensive, and there was an immense influx of each kind of stock from abroad, the total number imported amounting to 139,984 head, or nearly 40,000 more than in the first six months of 1863. This account does not include entries at the various outports. These heavy importations had, however, very little influence upon the trade, owing to the enormous consumption of meat in this country. Be it remarked, however, that at least two-thirds of the foreign beasts came to hand in very poor condition, and were principally purchased for feeding purposes at low rates.

In the early part of the season most breeds of English sheep appeared fully ripe for the butcher; but towards its close their quality fell off considerably, although the demand was in a healthy state. Downs and half-breds realised fully 5*s.* per 8 lbs. out of the wool, even with a decline in the value of rough fat to 2*s.* per 8 lbs. The number of lambs brought forward was only moderate, and there was a decided falling off in their quality: prices, therefore, fluctuated considerably. Very few English calves were brought forward; but the foreign calves were mostly in good condition, and the trade healthy. There was a very large arrival of pigs from Rotterdam and Hamburg; but the prices obtained for them did not exceed 3*s.* 6*d.* to 4*s.* per 8 lbs.

The prospect for the season for beasts from Lincolnshire, Leicestershire, and Northamptonshire, is fully equal to that of former years. The short-horns already received have been very [illegible] quite as much stock in process of fatting for

ondon market as at any former period; but the pastures been very bare of grass. On the continent the supply is ısing, but the stock now sent bears very little comparison our own breeds. Prime beasts and sheep are, therefore, to continue to be dear.

e annexed return shows the total numbers of each kind of exhibited in the great Metropolitan market in the first six hs :—

Total Supplies of Stock Exhibited.

ıalf of year.	Beasts.	Cows.	Sheep and Lambs.	Calves.	Pigs.
l	109,812	3005	604,650	6,560	15,952
2	116,735	3054	631,672	8,259	17,407
3	120,045	3005	628,072	10,449	16,435
4	131,694	3014	622,330	9,935	17,679

ıe aggregate arrivals of beasts during the present and four ious years were derived as follows :—

District Bullock Arrivals.

half of year.	Northern Districts.	Eastern Districts.	Other parts of England.	Scotland.	Ireland.
0	4,000	68,520	21,420	5033	1,477
1	47,000	64,060	17,700	8712	256
2	400	68,420	29,290	9794	2,545
3	470	66,940	16,330	9610	1,664
4	——	62,170	19,980	9918	2,740

ithin the past fifteen years the average prices have varied as ws :—

Average Prices of Beef and Mutton.

Per 8 lbs. to sink the Offal.

BEEF.

	1850.	1855.	1860.	1861.	1862.	1863.	1864.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
or ..	2 10	3 4	3 6	3 4	3 0	3 4	3 6
ing ..	3 6	4 4	4 6	4 4	4 0	4 4	4 6
..	4 2	5 0	5 6	5 0	4 8	5 0	5 0

MUTTON.

	1850.	1855.	1860.	1861.	1862.	1863.	1864.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
or ..	3 0	3 6	3 10	3 8	3 6	3 10	3 8
ing ..	3 6	4 4	5 2	5 0	4 6	4 8	4 6
..	4 2	5 0	6 2	5 10	5 4	5 6	5 2

The direct imports of foreign stock in the port of London were as follows:—

Imports in the first Six Months.

From	Beasts.	Sheep.	Lambs.	Calves.	Pigs.
Amsterdam	229	55	..	15	..
Antwerp	441	82	..	793	592
Boulogne	..	..	..	..	1,646
Bremen	511	46	..	..	..
Cadiz	41	..	..	..	..
Calais	..	70	..	28	928
Corunna	358	..	..	..	..
Dordt	585	3,903	1,399	40	44
Dunkirk	144	947	..	21	2,065
Gibraltar	134	..	..	..	..
Gluckstadt	..	..	..	..	33
Hamburg	2,121	44,816	..	32	3,806
Harlingen	12,723	10,631	663	872	86
Havre	..	180	..	..	86
Oporto	454	..	..	..	..
Ostend	1,476	5,550	26	1,268	1,900
Rotterdam	9,328	16,493	749	7,323	3,026
Schwening	414	310	..	..	..
Vigo	501	..	..	..	..
Total	29,460	83,083	2,837	10,392	14,212

In previous years the importations in the first six months into London only were as follows:—

Year.	Beasts.	Sheep and Lambs.	Calves.	Pigs.
1855	18,526	19,930	8,872	409
1860	17,193	76,415	7,965	2,492
1861	22,045	46,674	6,187	4,309
1862	11,462	49,332	9,459	883
1863	16,701	91,206	11,445	1,229

Immense supplies of meat were on sale in Newgate and Leadenhall, chiefly from Scotland and the north of England. Beef averaged from 3*s.* to 4*s.* 4*d.*, mutton 3*s.* 4*d.* to 4*s.* 8*d.*, lamb 5*s.* 8*d.* to 6*s.* 10*d.*, veal 3*s.* 10*d.* to 4*s.* 8*d.*, and pork 3*s.* 4*d.* to 5*s.* per 8 lbs. by the carcase.

Although the imports of foreign and colonial wool during the first six months were on a liberal scale, the demand for English qualities has been active, and prices have had an upward tendency. In this period the aggregate imports into England thus compare with last season:—

	1863.	1864.
	Bales.	Bales.
Colonial	249,997	283,162
Foreign ..	93,891	87,967
Total	343,888	371,129

Notwithstanding that the woollen trade has continued in a satisfactory state, no advance was realised for any kind of wool at the colonial sales held in the metropolis. The high range in the value of money, the oppressive tariff in America, and the limited inquiry for the continent, had the effect of inducing caution on the part of buyers. Annexed are the current rates paid for home-grown wools:—

	Per Pack of 240 lbs. £. s. £. s.
Fleeces:—	
South Down hoggetts	24 0 to 25 10
Half-bred hoggetts	29 0 to 30 0
Kent fleeces	26 0 to 28 0
South Down ewes and wethers	24 0 to 26 0
Leicester ditto	24 0 to 26 0
Sorts:—	
Clothing picklock	24 0 to 25 0
Prime and picklock	22 0 to 23 0
Choice	21 0 to 22 0
Super	18 0 to 18 10
Combing:—	
Wether matching	26 0 to 27 10
Picklock	24 0 to 24 10
Common	20 0 to 22 0
Hog matching	29 0 to 30 0
Picklock matching	24 0 to 26 0
Super ditto	20 0 to 22 0

XXII.—*Experiments with Salt upon Mangolds.* By Dr. Augustus Voelcker.

The last number of this Journal contains a Paper of mine, in which are recorded the results of salt experiments upon mangolds grown in 1862 on a stiff calcareous clay. This land is too cold and retentive of moisture for bringing roots to early maturity; the consequence is, that mangolds grown on it frequently do not get fully ripe by the time when the anticipation of frost renders it desirable to take up the crop.

On such land I have much reason to think common salt is of doubtful utility as a fertilizer, even when applied to crops which, like mangolds, are considered to be specially grateful for its application.

Indeed, my own experience is, that salt occasionally does more harm than good, not only to mangolds, but to other crops as well; and I have no hesitation in saying that, in cold summers, even a moderate dressing is injurious to mangolds when the

crop has to be grown on a cold calcareous clay, or on similar stiff soils.

At all events, the results of my experiments in 1862 were not calculated to demonstrate the utility of salt as a manure for mangolds. Knowing, however, how much the efficacy of all fertilizers is affected by the character of the land to which they are applied, I was desirous to try, another season, similar salt-experiments on a soil of diametrically opposite physical characters and chemical composition. A favourable opportunity for the performance of such trials was afforded to me, in 1863, by my friend and pupil, Mr. Kimber, of Tubney Warren, Abingdon, Oxfordshire, who selected one of his light fields for the purpose of trying the effects of quantities of common salt, varying from 1 to 9 cwts. per acre, upon mangolds. I am much indebted to Mr. Kimber for the care and interest which he took in these experiments, and the trouble he bestowed upon them.

The soil of the experimental field in 1862 was a light, almost blowing, hungry sand of great depth. By dint of good cultivation and liberal manuring the surface-soil was enriched with some organic matter and also with lime, as will be seen by the subjoined analyses.

Composition of Soil and Subsoil of Experimental Mangold-field.

	Soil taken 6 inches deep.	Subsoil taken at a depth of 2 ft. 6 in.
Moisture (when analyzed)	3·02	2·03
Organic matters and water of combination	4·19	2·70
Oxides of iron and alumina	4·13	3·82
Phosphoric acid	traces	traces
Carbonate of lime	2·07	·62
Sulphate of lime	·35	·59
Magnesia and alkalies	·41	·31
Insoluble siliceous matter (chiefly sand)	85·83	89·93
	100·00	100·00

Both in the soil and subsoil as will be seen, sand greatly predominates. The experimental field in 1863 in this respect presents a striking contrast to that of the preceding year, for the field upon which salt was tried in 1862 hardly contained any sand, and was very rich in clay and lime.

It will be found on comparison that the subsoil is much poorer in organic matter and in lime than the surface. In both the amount of alkalies (potash and soda) is very trifling, and that of phosphoric acid too small to admit of determination. In one word, the soil is a poor sand, yielding remunerative crops only when liberally manured.

In addition to ordinary farmyard dung, the mangold-crop

n on this light sandy soil was manured with nitro-phos-
, a sample of which on analysis yielded the following
ts :—

position of a Sample of Nitro-phosphate used in Mangold Experiments.

Moisture	19·04
*Organic matter and water of combination	18·61
Bi-phosphates of lime	12·78
Equal to bone-earth rendered soluble	(19·93)
Insoluble phosphates (bone-earth)	9·57
Sulphate of lime	33·26
Alkaline salts	1·60
Insoluble siliceous matter	5·14
	100·00
*Containing nitrogen	·81
Equal to ammonia	·98

he manure, it will be observed, is essentially a good super-phate, containing a moderate amount of nitrogenous matter. alf an acre of the mangold-field where the plant was most was set aside and divided into 10 parts. Each plot was thus th of an acre. A plot in the centre received no salt; the ers were dressed at the rate of from 1 to 9 cwts. of common per acre. Eventually another plot of 1-20th acre, adjoining alf-acre of roots under experiment, was added and left without This was done for the purpose of ascertaining how far the uce varied in two portions of the same field treated exactly in every respect.

e roots were counted on each plot, and, after cleaning and ing, accurately weighed.

e following table shows the manner in which the experi-al plots were disposed, and gives the produce as obtained by l weight and calculated per acre, and the increase due to pplication of salt.

XPERIMENTS with SALT upon MANGOLDS, grown on a poor Sandy Soil.

s of cre.	Salt applied per Acre.	Number of Roots per Plot.	Produce per Plot.		Produce per Acre.			Increase per Acre over Unsalted Plot, No. 6.		
	cwts.		cwts.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.
..	Nothing	510	13	8	13	1	48		..	
..	7	583	18	58	18	10	40	4	1	88
..	5	626	20	0	20	0	0	5	11	48
..	3	600	16	84	16	15	0	2	6	48
..	1	622	14	108	14	19	32	0	10	80
..	Nothing	615	14	48	14	8	64		..	
..	2	602	15	28	15	5	0	0	16	48
..	4	621	15	65	15	11	68	1	3	4
..	6	631	16	33	16	5	100	1	17	36
..	8	616	18	9	18	1	68	3	13	4
..	9	618	16	101	16	18	4	2	9	52

On Plot No. 1, where no salt was used, only 510 roots were grown; whilst on the 2nd unsalted plot (No. 6) 615 mangolds, or 105 more than on No. 1, were raised.

The deficiency of roots on No. 1, when multiplied by 20, so as to obtain the produce per acre, is considerable; and it is due, no doubt, to the difference of the number of roots on the Plots No. 1 and No. 6 that the weight of the mangolds on No. 6 was much heavier than those on No. 1.

In field experiments upon root-crops, not less than 1-20th of an acre should be reserved for each trial; and the number of roots should be counted when they are taken up; for, unless the number of roots on the several pieces agree pretty well with each other, the results of the different experiments are abnormal, and cannot be compared.

With the exception of No. 1, the number of roots on the other plots does not vary very much, though more than I like to see.

On No. 6 (unsalted), the number of roots approaches more nearly to that grown on the other plots, excepting in No. 1 and No. 2. The produce of No. 6, therefore, answers better for comparison than that on No. 1.

Notwithstanding some strange discrepancies in the results of the preceding experiments, it will be observed that common salt has had a favourable effect upon the produce in every instance.

The increase in the weight of roots on No. 2 and No. 3, is indeed, very considerable. As salt is a cheap manure, its use in every instance was most beneficial in an economical point of view.

The unsalted Plot No. 6 passed through the centre of the experimental half-acre. On one side of it, salt, at the rate of 1 cwt. per acre, was applied to Plot No. 5; and on the other side, 2 cwt. of salt on Plot No. 7. This order, it will be seen, was preserved up to No. 8, and we have thus, on the right side o No. 6, plots dressed with salt at the rate of 1, 3, 5, and 7 cwt. and on the left plots manured with 2, 4, 6, and 8 cwts. of sa per acre; to which is added No. 11, with 9 cwts. of salt.

In these trials, 1 cwt. and 2 cwts. of salt per acre did n appear much to affect the produce; whilst a dressing of 3 cwts. per acre gave large increase in the weight of mangolds

On poor, sandy soils, it would appear from these experimer [illegible] as large a dressing as 9 cwts. of salt per acre may be used wi [illegible]antage. I do not recommend so large a dose, but simp [illegible]ate that it gave 2½ tons more clean and dressed mangolds [illegible] than the unsalted portion of the same field. Probably 4 cwts. [illegible] sufficient dressing on the lightest sands; and [illegible] loams [illegible] warm friable turnip-soils 3 cwts.

lt probably will give a better result upon mangolds than a ·ger dose.

The reader of this Paper will do well to compare the present sults with those given in the last number of the Journal. e will be struck with the difference in the practical effect aich salt had upon mangolds in the two sets of experiments.

That salt is often injudiciously applied to the land can hardly denied; but, at the same time, its utility on light, sandy soils, think, cannot be gainsaid. At all events, the preceding experients appear to countenance this view, and to agree well with e experience of many intelligent light-land farmers.

In all field experiments anomalies are frequently observable, aich sometimes admit of a reasonable explanation; more nerally, however, the experimenter cannot explain why, in parently similar instances, consistent results should not be oduced; he has, however, no choice but to record faithfully his sults, and is not at liberty to reject those which do not accord th his anticipations. At the samé time, it is very desirable inquire into every particular which may or may not have an luence on the final result.

I am, therefore, indebted to Mr. Kimber for the following rticulars, which, I think, throw some light on the apparent omaly which will be noticed in the preceding experiment, mely, that on the one side of No. 6 (left unsalted) common t should have given a better result than on the other.

The following table shows the number and weight of the ghted roots in each experimental plot of 1-20th acre, and gives average weight of blighted and sound roots.

lots of Acre.	Salt applied per Acre.	Number of Blighted Roots.	Weight of Blighted Roots.		Average Weight of Sound Roots.		Average Weight of Blighted Roots.	
	cwts.		cwts.	lbs.	cwts.	lbs.	cwts.	lbs.
1 ..	Nothing	26	0	48	2	92	1	84
2 ..	7	29	0	80	3	60	2	75
3 ..	5	69	1	65	3	70	2	56
4 ..	3	146	2	83	3	47	2	10
5 ..	1	134	2	68	2	96	1	71
6 ..	Nothing	140	2	1	2	92	1	60
7 ..	2	110	1	93	3	5	1	86
8 ..	4	133	2	65	2	59	2	17
9 ..	6	121	2	33	3	7	2	12
10 ..	8	130	2	96	3	50	2	46
11 ..	9	172	3	73	3	32	2	37

It will be seen that the number of blighted roots was very ach larger on Plot 11 than on any other; and as the blighted ots weighed much less than an equal number of sound ones,

the produce of No. 11 was not nearly so heavy as it would otherwise have been.

Again, it will be noticed that on Plots 1, 2, and 3, there were not so many blighted roots as on the rest of the plots; and on Plot 3, where 5 cwts. of salt were used, a better result was obtained than on Plot 9, dressed with 6 cwts. of salt.

It is true on Plot No. 1 the number of blighted roots was small, and yet the roots weighed less than on No. 6, the second unsalted plot; but it must be borne in mind that the total number of roots on No. 1 was less by 105 than on No. 6. The deficiency of plants on No. 1 fully explains the difference in the weight of the produce on No. 1 and No. 2.

Notwithstanding these disturbing influences, which seldom can be avoided in field experiments, but which it is well clearly to recognise, the general tenor of all the experiments is, that salt had a very beneficial effect upon the crop.

In conclusion, I may mention that on 6 experimental plots the weight of leaves was carefully ascertained, and found as follows:—

	Weight of Leaves on $\frac{1}{20}$ Acre. Cwts.	lbs.
Plot No. 1. Nothing	5	93
„ 2. Salt at the rate of 7 cwts. per acre	8	1
„ 3. „ 5 „	7	41
„ 4. „ 3 „	7	2
„ 5. „ 1 „	5	80
„ 6. Nothing	5	20

It appears clearly from these experiments that common salt had a very marked influence in promoting the development of leaves. On light, sandy soils mangolds are liable to pass too rapidly through all the stages of their growth,—an evil which results in a poor crop.

Common salt, if I am not mistaken, checks this tendency in a great measure, and, by keeping the tops of mangolds in a healthy growing condition, contributes ultimately to a larger produce of roots on light land. It is hardly necessary for me to say that a healthy and abundant development of leaves is essential to the formation of good roots, for it is through the medium of the ones that the latter assimilate organic food and gain in substance.

Hanover Square, London, July, 1864.

XXIII.—*General Report on the Newcastle Meeting.*

By J. Coleman.

The Newcastle Meeting of 1864, notwithstanding some gloomy anticipations, has proved a great success; and as this was the first occasion on which the Royal Agricultural Society has paid a second visit to the same town, the authorities may be emboldened by the result of this experiment to follow the same plan on future occasions should circumstances justify such a proceeding. One special advantage arose from this arrangement, viz., that this Meeting afforded a means of comparison with that of 1846, and thus indicated the progress that has taken place in the interval.

The chief interest of the Meeting centres in the Implement trials, and especially in those relating to Steam Cultivation, which, under the fostering influence of the Society, has been developed from the regions of theory to the sober reality of economical practice. It is considered that steam power has now so far established its character that, considering the serious outlay involved in such contests, periodical trials might henceforth be advantageously substituted for annual competition. With this view the Society was desirous that the Newcastle experiments should be more comprehensive than those of previous years, and thus afford as it were a landmark and standard for comparison in the history of this great invention. The exertions of the Local Committee, and especially of Mr. Jacob Wilson and his colleague, Mr. Browell, who particularly devoted themselves to the furtherance of this object, were most praiseworthy. In selecting for the inspection of the Visiting Committee one of the finest of trial-grounds, in a district where such selection must have been extremely difficult, and also in advocating an increased grant of 200*l.*, in order to meet the very liberal offer of a similar sum made by Mr. Fowler, the Local Committee rendered important service: indeed, the successful character of the entire show was in no small degree attributable to the hearty co-operation afforded by the Local Committee and the authorities of Newcastle generally. With such an example before them, others were encouraged to zealous activity, and Stewards, Judges, and Exhibitors seemed determined to work together with a will. The Senior Steward of Implements, Mr. Torr, with his colleagues the Hon. A. Vernon and Lord Cathcart, were most unwearied in their exertions, and the Judges must have felt it a pleasure and privilege to act under such thoroughly painstaking and prac leaders. The efforts of the head officials may, however, be re dered comparatively ineffectual if those to whom the details

entrusted prove either inefficient or lukewarm. The Society was fortunate in having secured the services of such energetic Assistant-Stewards as Mr. Christopher Stephenson and Mr. Garbutt, to carry out the directions of Mr. Elphick, the experienced Manager of the Steam-Ploughing Department. Mr. Garbutt deserves especial notice for the great pains he took to provide horses for the various trials; the splendid teams which were the admiration of the spectators, were procured and arranged by him. Neither should the exertions of the foremen be overlooked. Mr. Coxon, who had charge of the Show-yard, was most prompt in forwarding implements to the trial-grounds. Mr. Moore, foreman of the Steam-ploughing, made excellent arrangement for victualling these voracious consumers. Mr. Gibson, foreman of Horse-ploughs, and Mr. Rogerson, foreman of Cultivators, &c., were equally efficient in their several departments.

The Implement-makers had an opportunity of showing their good-will in a manner which was fully appreciated by the Stewards. The Society were under a promise to complete the cultivation of Mr. Dod's stubble-field reserved for the trial of *Steam* Cultivators in Class I., and Mr. Jamieson's field in which the preliminary trials took place, and the tenants were naturally very anxious that this should be done, as from the dry hard character of the land, which in places had been much trodden, horse-cultivation would have been very difficult, and comparatively inefficient. After the trials were concluded, a considerable area remained unmoved, and the exhibitors, at much inconvenience, divided it amongst them and completed the work.

The police arrangements were excellent, and the success of the trials was in many instances secured by the assistance of the fine body of men under Mr. Wookey, whose courtesy and good temper under trying circumstances was very noticeable.

The accommodation afforded by the North-Eastern Railway to enable live stock, implements, and visitors, to reach and leave the Show was most satisfactory. A siding and temporary station were constructed at Benton, close to the trial grounds, by which implements were delivered with great despatch, and the public were enabled to reach the scene of operations in the most comfortable manner. There was no line, as at Worcester, [illegible] the Show-yard; nevertheless the carrying arrangements to and from the station were so good that stock, implements, and the public, were better provided for than on most former occasions. We are very pleased to hear on all sides the most satisfactory [illegible] as to the transfer of stock from the Show. Last year there [illegible] complaints. Many of the Shropshire sheep, for example, [illegible] Shrewsbury until Monday and Tuesday following [illegible] although the distance was so inconsiderable, whereas

'e know that on this occasion they were all home on the aturday night. The best thanks of the Society were very roperly presented to the North-Eastern Directors for the great ıcilities they afforded; not the least of which was the omnibus ɜrvice provided, which was an immense accommodation to the ublic.

And lastly, the Society beg most gratefully to acknowledge the ospitality of the Mayor, Sheriff, and Corporation of Newcastle. t would be invidious to draw any comparisons, especially as the ociety are generally so kindly treated wherever they go; but iis they can say, that those who were fortunate enough to profit y the kindness of the authorities of Newcastle, will bear away rith them a very pleasant recollection of the Royal Agricultural ociety's Meeting at Newcastle-upon-Tyne.

We may further express a hope that this visit of our Society, nd its efforts to manifest the efficiency of steam-culture, may ɜave some permanent impress on the agriculture of the North-ˈast. The level plains of tenacious soil which lie both north nd south of Newcastle, especially call for the action of steam 'herever the plough or cultivator is set to work, and however ıuch the present state of our general markets may favour an ıcrease of pasturage in a comparatively moist climate, still the ollieries of this district demand supplies both for man and orse, which must in part be provided near at hand. The steam-orse is at least as much wanted here on the surface of the ınd, as the quadruped is indispensable in the pit.

The Reports of the various Judges which follow have been repared for the press with as much despatch as was compatible rith a careful verification and revision of the important tables ttached to some of them.

ꞩTEAM cultivation having become a subject of national import-.nce, the Society decided upon making their last annual trial . much more extensive and complete test than had been possible ıt any previous Meeting. Accordingly they placed at the dis-ɔosal of the Judges upwards of 150 acres of land, partly clover-ey and partly stubble from last year's crop. The fields were evel, of good rectangular shape, sufficiently large, and, though .n three occupations, adjacent one to the other; being all in the parish of Long Benton, about four miles from Newcastle. The soil was remarkably uniform throughout, consisting of a deep strong loam, generally free from stones, sufficiently stiff to afford an excellent test of the capabilities of the different inventions for ordinary work. Any terms we may employ to describe the soil must necessarily be so indefinite, that a suggestion of one of the

Stewards* that a mechanical analysis might be made of fair samples of soils from each plot, deserves the consideration of the Society. Such a test would be valuable not only as a means of information to the public, but as a point to be considered by the Judges in making their awards.

In addition to the prizes assigned to two classes of cultivators last year at Worcester, the list of this year included prizes for implements, anchors, porters, and windlasses, and was arranged as follows:—

	£
CLASS I.	
The best application of Steam Power for the Cultivation of the Soil	100
Second Prize	50
CLASS II.	
The best application of Steam Power adapted for small Occupations	50
Second Prize	25
CLASS III.	
For Ploughs adapted to Steam Power	30
CLASS IV.	
For Cultivators adapted to Steam Power	30
CLASS V.	
For Harrows	20
CLASS VI.	
For Windlasses, and application of Power thereto	30
CLASS VII.	
For Anchors	20
CLASS VIII.	
For Rope Porters	15
Total	£370

At Worcester a *Gold Medal*, and prizes amounting to 100 ... fered.

Report of the Judges of Steam Cultivation at Newcastle.

The great increase in the amount and variety of the prize-list naturall[y] attracted numerous competitors. The work commenced on the afternoon [of] Tuesday, July 12th, in a stubble-field of Mr. Jamieson's, in which all th[e] machinery entered for competition was collected. Plots of about 1 acre eac[h]

* ... Hon. A. Vernon.

were marked out, lots drawn, and an opportunity afforded for a preliminary trial, in order that those in charge of the machines might see that everything was in working order, and that any radically defective apparatus might at once be scratched from further competition. The advantage of this plan was again evident, two exhibitors, Messrs. Richardson of Linsey Works, Lincolnshire, with a new Steam Engine, invented by G. W. Darley, and Fowler's Anchor Windlass, &c., and Mr. Collinson Hall, with two 6-horse engines of E. R. and F. Turner, of Ipswich, fitted with his polygonal drum, and intended to haul the steel-link rope, did not again compete. The novelty in Mr. Richardson's engine consists in the boiler being constructed of steel plates, so as to combine strength with lightness (his 10-horse engine weighing only 3 tons), and in the use of Allen's Patent Cylinders, so constructed as to economise fuel by the complete expansion of the steam. This is accomplished without any separate expansion-valve, the cylinders being provided with an internal trunk. We had no opportunity of judging of the merits of this engine, as the attendants, for reasons unexplained, never had it ready for trial. The engines of Messrs. Turner, though too small for stiff work, are of ingenious construction, and particularly commendable for the simple manner in which Mr. Hall's drum is detached. This is accomplished by removing a pin, when the whole of the windlass can be lowered, and the engine is ready for ordinary farm work. There are other points in which these pony engines are deserving of notice. Locomotion is effected by having two speeds for the pitch-chain, which drive one or both hind wheels. The small travelling-wheels in front can, by means of a worm-wheel and steering-rod, be locked by the driver at a right angle; the engine can thus be turned in little more than its own length. The weight of each engine complete is 4 tons; the price, with the drum attached, 325*l*. As far as we could ascertain, no great alteration has been made in Mr. Hall's invention since the Worcester meeting. The link-chain, which forms the chief feature of his system, is constructed in 18-inch lengths of half inch steel rod, connected by pairs of plates 6 inches long, held together by rivets. Its weight is more than double that of the ordinary wire rope. By some error of construction, the drums were not cast true, and varied 3-sixteenths of an inch; consequently the projections, instead of receiving the plates, came in contact with the rods, and were broken in consequence. This accident was repaired, and although Mr. Hall withdrew from competition, his tackle being evidently in an unmatured state, we had an opportunity of seeing the apparatus at work for a short time on Friday. There appeared great friction between the angular surface of the drum projections and the plates of the link-chain; had the edges been rounded off, this would have been avoided, and the rope would have left the drum without that clinging tendency which must have increased the draft. The anchor differs from Fowler's, in not entering the ground at all; its four rather small wheels travelling on lengths of angle iron, kept in place by iron struts driven into the ground. These rails are easily taken up when clear of the anchor, and relaid in front. The question is whether the struts are capable of resisting the strain when the work is severe. This anchor is commendable for its simplicity and the ease with which it can be moved from field to field. The friction on the joints of the rope, and especially the rivets, must be very great, and we fear breakages would be frequent, from the rope not properly lapping over the projections on the drums. This would inevitably happen should any of the rods become bent, which might easily occur. The system does not embrace porters, and it would have been interesting, had time allowed, to have tested the draft of this rope dragging on the surface, against the wire rope properly "portered." We were much impressed with the amiability and good temper exhibited by Mr. Hall under his trying disappointment. Whilst these preliminary trials were in progress, the judges were employed in arranging the fields for the

different trials, and in giving directions to the surveyor for the measurement of the lots. Much valuable time during the earlier part of the trials was thus consumed; and the judges would respectfully suggest that in future it would be desirable that the visiting Committee be empowered to decide upon the size of the plots, and arrange for their being measured and marked out, so that the judges would merely decide as to the sites most suitable for the various trials.

As three of the fields were clover ley, it was decided to test the capabilities of competitors in Classes I. and II., for both ploughing and cultivating, without, however, disqualifying any merely cultivating apparatus from inability to plough.

Class I.

On Wednesday, July 13th, the real work commenced with Class I., ploughing clover ley, 7 inches deep. Five competitors appeared, but as Messrs. Stevens, and Garrett and Sons employed the same power (Savory's double engines), the trial for the latter firm was necessarily deferred until the following day. The first three entries occupied a field adjoining the scene of Tuesday's operations, Messrs. Stevens and Garrett and Sons being placed side by side in a ground of 14 acres on the other side of the road.

The following Table will explain the method of trial adopted, and it will be seen that some new tests were introduced. The time occupied in getting up steam, and in arranging the tackle for work after reaching the field, was accurately noted; and it may be as well to remark here, that in all cases the work was entirely performed by the regular staff belonging to each system, extraneous assistance being forbidden. The entry of fuel includes all that was employed from the time of lighting the fires until the work was completed. In arriving at the last column, total cost per acre, the same calculations as to wear and tear and interest on capital were adopted as at Worcester. Not that such figures are absolutely correct. The great speed at which machinery is often driven at such trials causes increased wear and tear; and probably, if we doubled this item, we should be nearer the mark. The reader can make his own calculations; by adhering to the same data comparisons are rendered easy. The labour-column will be found to vary slightly from the same figures at Worcester. The cost of the water-cart and lad, taken at 4*s.* a day, is included; also a charge for oil, varying from 1*s.* to 1*s.* 6*d.* a day, according as the system requires one or two engines.

Plots 1 and 2 fell to John Fowler, who occupied Lot 1 with his 14-horse engine and anchor, in precisely the same manner as at Worcester. The four-furrow balance-plough, with slack gear, was used on both plots. The speed was here very moderate; and it was evident that Mr. Fowler was specially desirous of showing good ploughing. The engine was driven with great steadiness, and the work was excellent; indeed, it would have borne comparison with much of the horse-ploughing which took place in an adjacent field. From close observation during these trials we are convinced that good ploughing is impossible at a speed exceeding $2\frac{1}{2}$ miles per hour. If driven faster, the implement, whatever its construction, becomes unsteady in its movements, either jumps out or draws into the soil, according to the amount of resistance, and the furrow is left in a broken, uneven condition.

Steam does not shine as a ploughing-power. Fortunately it is not often that complete inversion of the soil is necessary or desirable. Cultivation, digging, or smashing, will generally prove far more beneficial. All Mr. Fowler's implements are on the balance or equipoise principle; whilst there is great merit in this arrangement there is one disadvantage which was noticeable throughout the trials. This principle enables you readily to lift the frame out of work, ... its action, but tends to prevent the ploughs from at once entering

CLASS I.—TABLE I. COMPETITION OF STEAM PLOUGHS, working 7 inches deep.

Names.	Number in Catalogue.	Price.	Working Pressure of Steam in lbs.	Nominal Horse-power.	Time required to get up Steam.		Time required to set down Tackle.	Working time.		Total Fuel consumed.			Cost of Labour and Oil per Day.		Work done.			Number of Acres per Day of 10 Hours.	Cost of Coal per Acre, 1s. a cwt.		Wear and Tear and Interest on Capital per Day.		Total Cost per Acre.	
		£.			H.	M.	M.	H.	M.	cwts.	qrs.	lbs.	s.	d.	A.	R.	P.		s.	d.	s.	d.	s.	d.
1. Fowler ..	1539 and 1544	875	100	14	1	19	40	5	29	6	0	25	16	0	3	1	2	5·94	*1	10·8	15	3·7	7	2
2. Fowler ..	1540 and 1545	1066	90	2 engines, 7-horse power each.	0	50	12	5	28	7	3	25	18	0	4	2	36	8·64	1	8·3	18	7·8	5	11·1
3. Savory ..	2284 1609 2286	785	100	12	0	50	47	4	58	8	3	25	16	0	3	0	27	6·38	2	9·9	13	8·8	7	5·5
4. Steevens	1316 and 1310	1160	90	2 engines, 12-horse power each.	0	56	6	5	16	13	0	20	17	6	5	0	3	9·53	2	7·5	20	3·6	6	7
5. Garrett ..	1593 1594 1609	1175	90	Same power as No. 4.	0	56	6	5	35	13	0	20	17	6	4	3	16	8·69	2	8·6	20	6·2	7	1·1

N.B.—The same figures are adopted for wear and tear and interest as in the Worcester Report, viz. 12½ per cent. for wear and tear, and 5 per cent. for interest divided over 200 days. Oil is charged 1s. a day for single engines, and 1s. 6d. a day in the case of double engines, and is included in the labour column.

their work to the full depth; consequently we find that the anchor lad is frequently called upon to add his weight; still more headland is left unploughed, or irregularly ploughed out than by some other implements. As soon as the slack drums tighten the rope the pressure of the tail-rope helps to keep the plough to its work. But if the system has this objection, which we think cannot be denied, it has the merit of *flexibility*, if we may use the term to express the capacity of the implement to adapt itself to irregularities of surface. This may in some measure be attributed to the influence of larger wheels in steadying the draft. Thus, if worked across, ridge and furrow, it will be found that the balance-plough moves more soil through the low ground than any other implement yet invented. The cost for labour, &c., was as follows:—

	s.	*d.*	
1 engineer	3	6	a day.
1 ploughman	3	0	"
1 anchor-lad	2	0	"
2 porter-boys, 1*s.* 3*d.*	2	6	"
Water-cart and lad	4	0	"
Oil	1	0	"
Total	16	0	

When the Judges stopped work at 6 P.M. a considerable portion of the plot, originally about 5 acres, was unfinished. In all cases the land actually ploughed was measured after the work was over, the shortest length being taken in each case, as the headlands would have to be ploughed up to this point.

"*On Lot* 2," Fowler worked two seven-horse single-cylinder engines, acting simultaneously on opposite headlands. The engines are fitted with clip-drums, reversing gear, &c., precisely similar to those attached to his ordinary engine. "*This arrangement of power was the chief novelty of the Show.*" At Worcester double engines were first exhibited alternately in action. It was suggested that a great improvement would result if the engines could be made to work together. This was then considered impracticable; and yet in one short year we have the idea matured. A great step has been taken in the history of steam-cultivation, which may fairly be claimed as the result of that prize system which has been in some quarters so rashly and sweepingly condemned.

And how has this been brought about? By a simple and apparently insignificant alteration in details: formerly the joints which connect the different lengths of rope could not travel round the clip-drum, the friction-pulleys being fixed in a certain position would cause an obstruction and consequent fracture; the 400-yard rope worked round the clip-drum; the joints travelled round the anchor sheave; and the length of furrow could not exceed about 350 yards. These pulleys are now hung upon an upright axis, and have a free motion, which allows them to give way when a joint passes. They are brought back to their position by the action of an indian-rubber spring which connects them together, and which is strong enough to keep the pulleys properly pressing on the rope. This arrangement works admirably; and during the two days' trials to which these engines were subjected we never found that the rope exhibited any tendency to slip, so perfect was the grip of the clip-drum.

The pace was here considerably faster than on Plot 1, Fowler evidently being desirous of showing economy of cost rather than excellence of work. The furrow was consequently more broken and irregular, but still we considered the work creditable. The engines worked smoothly, and, so far as we could ascertain, appeared to bear an equal share of work in either direction. We would direct attention to the particulars of getting up steam—nearly half an

hour less than the 14-horse engine—to the time required to arrange the tackle in the field, which was carried without the assistance of horses, and likewise to the fuel consumed. The engines were masters of their work; and, acting in combination, appeared to possess more power than the large engine and anchor; but no tests were employed to determine this point. The advantages of this system appear to be: that horses are not required to move tackle; that there is a saving of time in setting down, taking up, and removing from field to field; that the two small engines are both available for ordinary farm-work, such as thrashing, driving, barn-work, &c.; and what is most important, that, in the event of an *accident to one engine*, the work need not be stopped, as by the aid of an anchor the single engine could still proceed with the work, slowly, it may be, but still making some progress, at, perhaps, a critical time, when total suspension would be disastrous. Nay, we do not see why on very large occupations, or for purposes of hiring out, two anchors and extra rope might not be provided, so that in light work, such as scarifying stubbles after harvest, or crossing fallows in spring, two sets could be employed, and thus an immense amount of work accomplished. This adaptability to varying circumstances must always be considered a point of importance. The cost of labour, &c., is as follows:—

	s.	d.	
2 engineers	7	0	a day.
1 ploughman	3	0	,,
2 porter-boys	2	6	,,
Water-cart and boy	4	0	,,
Oil	1	6	,,
Total	18	0	

Plot 3 was occupied by Messrs. Savory and Son, of Gloucester, who worked a 12-horse Double Cylinder Engine, furnished with two winding-drums, travelling round the boiler, and acting precisely on the same principle as the windlass exhibited by Messrs. Howard, only attached to and forming part of the engine: they worked Howard's Four-furrow Plough and Fowler's Anchor. Not being provided with the required length of rope (1200 yards) they were unable to plough the whole length of the furrow. Owing to frequent stoppages to adjust the plough the work was slow, and the consumption of fuel greater than it should have been. The quality of the work was good, and second to Plot No. 1.

This Engine can be used with either self-moving anchor or with fixed anchors on the round-about system, and is well adapted for colliery work, &c. The windlasses are thrown in and out of gear by a lever on the tender, which acts through a connecting-rod upon spur-wheels, throwing one into gear and the reverse one out. Cam-wheels regulate the guide-pulleys, which work from right to left, coiling the rope on the somewhat narrow drums with great regularity. Considerable power, however, appears to be consumed in this arrangement, and we noticed that the engine was not so steady or smooth in its motions as their double engines. For thrashing, a cross shaft is driven through the smoke-box from the fly-wheel. In case of stoppage a break is used to prevent slack rope being thrown off. An arrangement of this sort on the double engines might be useful. The cylinders are placed above and below the boiler, and occupy a position nearly in the centre of the engine. Altogether this apparatus has considerable merit. The particulars of labour being identical with Lot 1, are not repeated.

Lot 4, in another field, fell to Mr. Steevens, who employed Garrett and Son's Double Engines (Savory's patent), working his Four-furrow Plough

and Cultivator combined. It is only fair to state that the surface i was somewhat trodden, and in places the furrows had to be cro implement, disadvantages which were duly noticed by the Judge at Worcester, the implement was driven too fast to allow of ; The furrow was most irregular and broken, and in places it w to decide from the appearance of the surface whether it was ploughi vating. The depth was unequal, and altogether indifferent work Mr. Steevens has considerably strengthened and improved his impl Worcester; the principle is the same, but the arrangements for s reversing the lower frames, which carry the working parts of t are by an ingenious arrangement made to work in each other—t connecting-rod by which the frames are raised passes through the s which is hollow. This implement was so briefly alluded to in th Report that we think a short description may be acceptable. It rectangular in outline, and of equal height from back to front; c two frames, of which the upper one is fixed, having small wheels a travelling on the hard surface, which tend to keep it rigid; the un divided into two portions, each being independent. The cultiva ments are fixed to the lower frames, and are elevated and depresse of a rack and pinion. The man's seat is part of the upper fra implement when entering the soil takes its depth according to th which it is regulated by the rack and pinion, uninfluenced by The implement enters the ground more readily than the balance p on a perfectly level surface and mild soil would undoubtedly make where the surface is irregular and hard, the depth is uneven, and and furrow were crossed the work was very bad, little or no soil t through the low ground. The rapidity with which the double en work was very remarkable, only six minutes being occupied in p the tackle, and this without any employment of horse-power. were not applied to the trial No. 5 on the following day; but sinc coal consumed by Messrs. Garrett and Son whilst in work was 1 14 lbs., it was assumed that the difference between this and 13 c the fuel used by Steevens, would be required to get up the steam engines.

Messrs. Garrett worked one of Howard's Four-furrow Ploughs, be described further on. The pace was rather slower than wit implement, the furrow less broken, and the depth more even. Th fair, though not nearly equal to that made on Plot 1. The labo was—

	s.	*d.*	
Two engineers	7	0	a day.
One ploughman	3	0	„
One porter-lad	2	0	„
Water-cart and boy	4	0	„
Oil	1	6	„
Total	17	6	

We noticed an improvement in these engines in the position of th which were formerly in the front, and are now brought to about th the engine and placed above and below the boiler. The winding-dr smoothly, and the guide-pulleys coiled the ropes with great reg great weight of these engines—nearly twelve tons each when at wo fuel consumed for work done, are items which contrast unfavo Fowler's double engines working simultaneously.

CLASS I.—TABLE 2. COMPETITION of STEAM-CULTIVATORS, working nominally at 8 inches deep.

Name.	Number in Catalogue.	Price.		Working Pressure of Steam in lbs.	Nominal Horse-power.	Soil moved per Acre in Tons.	Nature of Work.	Working-time.		Fuel consumed whilst at Work.			Labour and Oil per Day.		Work done.			Number of Acres per Day of 10 Hours.	Cost of Coal per Acre, at 1s. per cwt.		Wear and Tear, and Interest on Capital per Day.		Total Cost per Acre.	
		£.	s.					H.	M.	cwts.	qrs.	lbs.	s.	d.	A.	R.	P.		s.	d.	s.	d.	s.	d.
1. Fowler	1540, 1553	1034	0	70	2 engines, 7-horse power each.	775	Cultivation.	3	47	5	1	0	18	0	5	0	22	13·58	1	2	18	1·1	3	8
2. Garrett	1593, 1594, 1612	1028	10	73	2 engines, 12-horse power each.	691	Ditto	2	49	11	1	14	17	6	5	0	1	17·77	2	3·3	17	11·9	4	3·2
3. Savory	2284, 2285, 2287	726	0	100	12	749	Ditto	Time not taken, owing to accident.		..			16	0	4	3	20	..	..		..		..	
4. Fowler	1539, 1544	875	0	105	14	920	Digging	6	3	9	2	14	16	0	5	0	10	8·37	1	10·7	15	3·6	5	7·5

The remaining trials in Class 1 for Implements competing as *Steam Cultivators* took place on Saturday, July 16th, in a field of thirty-four acres, belonging to Mr. Dod. This was the strongest portion of the land, though still not to be compared with the seven years' fallow field at Worcester. But if the soil was not extraordinarily stiff, it was remarkably dirty, the surface presenting a complete mat of running grass, amongst which the Onion Couch, *Arenatherum arenaceum*, was very conspicuous, and appeared to excite the curiosity of spectators, to most of whom it was a novelty. The field was old stubble; the lots about five acres each, and twenty chains long; the implements working up and down the lands. Four competitors appeared: Messrs. Fowler, with two sets, and Messrs. Garrett and Savory, both using different forms of Howard's Cultivator. Mr. Steevens having no power to draw his implement was unable to compete, which was of the less importance as it came into competition in Class 4.

These trials, being properly regarded as affording the most important test of the value of the different systems, excited much interest; and as the work was prolonged from about 11 A.M. till 7 P.M. the public had an excellent opportunity for careful inspection.

Lots were drawn in the following order.

Mr. Fowler occupied Lot 1, with the double engines working a 4-tined Cultivator. This work was very good, the surface left somewhat rough and open; the ground thoroughly disturbed, the bottom clean and even, and a depth of fully 6 inches moved. The engines were driven at a moderate pace, and consequently good work was possible. Although working deeper than either of the other Cultivators upon a very foul surface, there was no tendency to clog up the form of the frame and breasts allowing the implement to clear itself. The quantity of soil actually moved per acre was 775 tons, exceeding the best work of Howard's Cultivator by 26 tons. We prefer the work by this implement, because, in the event of heavy rain, the vegetable matter would not grow so readily, being more thoroughly shaken and separated from the soil, and in the succeeding operations the implements would more readily break up a rough than a smooth surface.

Lot 2, Garrett's Double Engines (Savory's patent) came next, working one of Howard's large 7-tined Cultivators. The surface was left flatter than Fowler's. The depth did not average more than five inches, the implement overlapped its work, and in places portions were missed. This latter fault was no doubt attributable to the great pace at which the implement was driven (one of the Judges, who was also at Worcester, remarked that these engines could not work slowly). The plot was finished nearly an hour sooner than the others. Notwithstanding the excessive pace, the fuel consumed was enormous, a serious item in most districts. When a request was made that the depth of the work should be increased, the implement immediately clogged up. The soil moved was 691 tons per acre, 84 tons less than Lot 1.

Lot 3 fell to Savory and Son's Double Windlass Engine, working Howard's small Cultivator with Fowler's Anchor. A series of accidents prevented [illegible] from keeping an accurate record of the time. These delays appeared partly due to a want of proper arrangement. Thus the Anchor was placed at too great an angle in reference to the power, and consequently dragged; later the pumps would not work. The land was well moved, the depth about [illegible] inches, the bottom fairly even, and the soil disturbed 749 tons per acre.

Lot 4 was drawn by Fowler, who used his 14-horse engine, clip-drum and ballass, as employed on Lot 1 of the ploughing competition. We believe [illegible] original intention was to use the 7-tined balance Cultivator, but finding [illegible] firm for this implement, which is intended to cross land alrea[illegible]

roken up, he sent for a powerful 3-tined digger, using Cotgreave's forked reasts. This change of plan caused considerable delay, so that noon was ast before work commenced. The public were recompensed for the delay, by he sight of some splendid work which we consider fairly deserved to be called igging, as the soil was broken up from 8 to 9 inches deep. This implement ppears to us the most perfect that has as yet been used for steam cultivation; t was not the most suitable for the job in hand, as it partly buried the ubbish which should have been on the surface, but as a means of breaking ıp the soil in rough masses, and leaving the surface exposed to the influence of frost, it is invaluable for autumn work. The soil, 920 tons per acre, was horoughly moved, an even bottom being left.

We may here remark that having tested the capacity of the various systems for getting up steam, preparing for work, &c., in the previous trial, no further notes were taken on these points. The coal consumed as noted in Table II. s the quantity employed during actual work. In each case the soil was carefully shovelled away, so as to leave a trench right across the work—the character of the bottom was thus ascertained. Our Awards were as follows:—

First Prize, 100*l.*, to John Fowler, for his two 7-horse Engines, &c. (1540).
Second Prize, 50*l.*, ,, 14-horse Engine, Anchor, &c. (1539).
Highly Commended. R. Garrett and Sons, for Improvements in Double Engines (Savory's patent).

Class II.

The trial of systems for small occupations was conducted on precisely the ame plan as those in Class I. On Thursday, July 14, ploughs working 7 nches deep competed. There were three entries: Messrs. Howard, and Messrs. Fowler with two systems. Lots of about 3 acres were measured out side by ide. The soil was uniform in character and easily stirred.

Lot 1 was drawn by the Messrs. Howard, who used one of Clayton and Shuttleworth's 10-horse Portable Engines, working their double windlass and our-furrow plough on the well-known round-about system. There is little lteration to notice in their well-made machinery since the Worcester Meeting. The *windlass* has been strengthened by the extension of the supporting brackets. The arrangement for throwing either windlass in or out of gear is ngenious and simple. The shaft works on an eccentric, so that either end an be lowered or raised; as the windlass is lowered its motion is instantly rrested by a wooden break, and when again it is partially raised, and placed n position, a gentle check is maintained which prevents the slack rope rom being given off too rapidly; the power that would otherwise be lost, by this operation is partially reclaimed by the action of the double snatch-block, which, since Worcester, has received the addition of a flange on the lack-rope disc.

The plough consists of a strong carriage on four wheels, the moveable frames t either end carrying the working parts, which when out of ground are supported by strong springs fixed on the carriage. The plough is steered by a ever action on the front wheels. The implement has been considerably trengthened, and the vibration noticed in the Worcester Report is not now isible. The Anchor arrangements were unaltered, and there was still the ame liability to drag, though no accident of the sort occurred. We particuarly call attention to the time occupied in getting up steam and setting down he apparatus as detailed in Table No. III., and to the large horse-strength equired to move the apparatus from field to field: to do this at one operation would require about 8 horses—a greater strength than ought to be found on a mall occupation using steam power. The cost for labour, &c., would be:—

Engineer

CLASS II.—TABLE 3. COMPETITION of STEAM-PLOUGHS, working 7 inches deep.

Name.	Number in Catalogue.	Price.	Working Pressure of Steam in lbs.	Nominal Horse-power.	Time required to get up Steam.	Time required to set down Tackle.	Total Fuel consumed.	Cost of Labour and Oil per Day.	Working time.	Work done.	Number of Acres per Day of 10 Hours.	Cost of Coal per Acre, at 1*s.* per cwt.	Wear and Tear, and Interest on Capital per Day.	Total Cost per Acre.
		£.			H. M.	M.	cwts. qrs. lbs.	*s.* *d.*	H. M.	A. R. P.		*s.* *d.*	*s.* *d.*	*s.* *d.*
1. Howard	1608 1609	630	80	10	1 10	52	7 1 17	20 6	3 32	2 3 28	8·27	2 6·3	11 0·3	6 4
2. Fowler ..	1541 1548	630	100	7	0 52	35	3 2 14	16 0	3 26	2 2 17	7·59	1 4·6	11 0·3	4 4·2
3. Fowler ..	1543 1544	587	80	10	1 10	Not taken	6 0 14	18 6	3 59	2 2 17	6·54	2 4·3	10 3·2	6 9·2

N.B.—The same figures are adopted for wear and tear and interest as in the Worcester Report, viz. 12½ per cent. for wear and tear, and 5 per cent. for interest distributed over 200 days. Oil is charged 1*s.* a day for single engines, and 1*s.* 6*d.* a day for double engines, and is included in the labour column.

	s.	d.	
Engineer	3	6	a day.
Ploughman	3	0	"
Windlass-man	2	6	"
2 anchor-men	4	0	"
2 porter-boys	2	6	"
Water-cart and boy	4	0	"
Oil	1	0	"
Total	20	6	

The work was very good, the furrow laid over evenly, and the dept rally well maintained: nor must it be forgotten that the round-about sy specially adapted for fields of irregular shape, as it can work corners would be difficult if not impossible for the direct system to deal with.

Lot 2 was selected by Mr. Fowler for one of his 7-horse Engir Anchor, working a three-furrow plough, driven at a pressure of 100 the square inch; the work done was really extraordinary, much t however, for the furrow to be even; it was more broken and irregular Lot 1. The engine moved into the field, drawing the plough behind versing stiff ridge and furrow; three horses brought the remainder of the which was ready for work in 35 minutes after reaching the field. T sumption of fuel, including getting up steam, was very moderate. The the same as that required by the 14-horse Engine as already detailed.

Lot 3 was also occupied by Mr. Fowler, who here showed a modific his system suitable for an ordinary 10-horse Portable Engine. A self- clip-drum on a carriage, firmly attached to the engine, was driven fr fly-wheel by a belt composed of wooden joints faced with iron. This ru loose, and being of considerable weight bellies down so as to take a go of both the driving and driven wheels; the clip-drum carriage draws it the engine forward as the work proceeds, by winding up a rope precisel same way as the moveable anchor; the windlass-man throwing the d and out of gear at the same time that he reverses the motion of the clip It is a very ingenious arrangement, and may deserve the consideration who already possess a portable engine, and have good square fields. S the best, we must regard it as a makeshift, and liable to the same obje Messrs. Howard's system—viz., the large strength of horses requi removals, and the longer time consumed in preparing for work. These unfortunately could not be ascertained, in consequence of Mr. Fowler's being unprovided with the regulation steam-gauge, so that operatic delayed about two hours whilst one was fitted on. We believe, howev about the same time would be taken up in this, as in the precedin The four-furrow plough was used, and the work done was excellent. plots were of unequal length, the Judges counted the number of turn by each implement, and allowed accordingly. The labour, &c., en amounted to—

	s.	d.	
1 engineer	3	6	a day.
1 ploughman	3	0	"
1 windlass-man	2	6	"
1 anchor-lad	2	0	"
2 porter-boys	2	6	"
Water-cart and boy	4	0	"
Oil	1	0	"
Total	18	6	

On Friday, July 15th, the trial of *Steam Cultivators* in Class II. took place, in two fields of Mr. Smith's, on the Rising Sun Farm, and we have never seen more excellent trial-grounds. The fields were rectangular, nearly equal in size, 20 and 21 acres respectively, and remarkably even in character. By dividing them in half, plots of about 8 acres were obtained; they were in stubble from last year, and the surface was covered with a goodly assemblage of running weeds, amongst which the onion couch was again conspicuous; we venture to assert that never before has the Society been able to offer such an opportunity for a fair day's work.

Lots were drawn, and the four competitors were thus arranged:—Mr. Fowler occupied the upper half, and Messrs. Coleman and Morton the lower part of the first field, whilst Mr. Fowler and the Messrs. Howard were placed in similar positions in the adjoining field.

Lot 1 was occupied by Mr. Fowler with the portable engine and clip-drum carriage, described above, working a 4-tined digger with Cotgreave's breasts. This implement made good work: it appeared, however, to move much more soil than was actually the case; for though nominally working at 8 inches, it really attained a depth but little over six. The importance of ascertaining the exact weight of soil moved was here evident, and we think it desirable that this test should be extended at future trials. Time only allowed us to weigh 3 yards on each plot; two being taken from the top of the ridge, and the third from the furrow. The mean of the three gives the average weight of a yard of soil moved; greater accuracy would be ensured if the mean of more plots were taken.

On Lot 2 Messrs. Coleman and Morton exhibited their system of cultivation, in which two implements are alternately at work, and always when at work are being drawn towards the engine. There is thus little or no strain upon the anchor, which is much the same as an ordinary snatch-block, whilst the tail-rope is less than half the weight of the draft-rope. The implements meet in the middle of the field; they are constructed on the same principle as the celebrated horse-cultivators of this firm. The engine is a 10-horse double cylinder traction-engine, furnished with two small winding-drums, which are reversed by the engineer. Guide-pulleys, working on a rack, which is moved by the windlass-man, keeps the rope well coiled on the windlasses. The anchor requires moving at every three ends, or after 1½ bouts. Labour employed consists of—

	s.	d.	
Engineer	3	6	a day
Windlass-man	2	6	„
Two men cultivating	6	0	„
Anchor-lad	2	0	„
Water-cart and boy	4	0	„
Oil	1	0	„
Total	19	0	

[illegible] ch in this case only was in a direction across the furrows, [illegible] arge amount of soil being moved; depth about 5½ inches; [illegible] ottom fairly even, though here and there the narrow tines had grooved [illegible] bed, and left the soil high on either side; the surface was left in a good [illegible] ition for further operations. Much time was lost from one of the Cultivators breaking from contact with a very large stone; so that when work was [illegible] opped at six o'clock, not more than half the plot was completed. We question [illegible] hether th[illegible] ines are sufficiently strong for stony land. The soil moved was [illegible] 41 tons [illegible] the most by any of the Cultivators. This was, no doubt, [illegible] across the furrows, and to their capacity for

CLASS II.—TABLE 4. COMPETITION OF STEAM-CULTIVATORS, working nominally at 8 inches.

Name.	Number in Catalogue.	Price.	Working Pressure of Steam in lbs.	Nominal Horse-power.	Soil moved per Acre in Tons.	Nature of Work.	Working time.	Fuel used in actual Work.	Labour and Oil per Day.	Work done.	Number of Acres per Day of 10 Hours.	Cost of Coal per Acre, at 1s. per cwt.	Wear and Tear, and Interest on Capital per Day.	Total Cost per Acre.
		£.					H. M.	cwts. qrs. lbs.	s. d.	A. R. P.		s. d.	s. d.	s. d.
1. Fowler ..	{1543, 1544}	587	70	10	680	Digging	6 53	13 2 14	18 6	6 0 14	8·84	2 2·8	10 3·2	5 6·9
2. Coleman	548	700	80	10	641	{Cultivating.}	4 24	6 3 11	19 0	3 2 22	8·26	1 10·5	12 3	5 7·8
3. Fowler ..	{1541, 1553}	620	110	7	503	Ditto ..	5 12	6 1 14	16 0	7 3 0	14·9	0 9·8	10 10·2	2 7·4
4. Howard	1608	550	58	10	620	Ditto ..	5 7	13 0 0	20 6	7 2 29	15·01	1 8·3	9 7·5	3 8·3

for going into the low ground. The total cost will appear heavy, probably some extra fuel was consumed in consequence of the delay.

In the adjoining field Messrs. Fowler and Howard ran a neck-and-neck race. Fowler occupied Lot 3, the upper portion, with one of his 7-horse engines, working a 4-tined balance Cultivator. The pressure of steam was seldom less than 105, and ranged between this and 115 lbs. on the square inch. The pace was tremendous; consequently the work was irregular, and in several places portions of ground were missed. The depth varied, but would not average more than five inches; and, as will be seen by reference to the Table, less soil was moved than on any other lot. We strongly deprecate these racing trials, which really afford no criterion of what can be done in an ordinary day's work on a farm. Here was a rare opportunity for showing really good work in a practical form; and instead of this we saw the power of a nominal 7-horse engine to do the work of a 12 or 14-horse engine, and some very indifferent cultivation. We trust the public will not suppose that good cultivation can be effected for a total cost of 2*s*. 7·4*d*. per acre. If they double this sum they will probably be still under the mark. Except on quite light soils, a 7-horse engine is not sufficiently powerful; and we are convinced that Mr. Fowler would not recommend his customers, except under peculiar circumstances, to invest in a *single* engine of this class. It is always good economy to have so much power that the engine may be master of its work. What would be the condition of an engine after a year's work similar to this trial? Would it not be worn out, or at any rate greatly injured? Our calculations for wear and tear are, consequently, altogether insufficient for such work as this.* Then, again, let it be borne in mind that good work on a hard unbroken surface is impossible when the implement is driven fast. Three miles an hour is the outside pace for work such as this, and whenever this is exceeded something must suffer. There is another consideration that may well induce the Society to check such exhibitions, viz., the public safety. It was a most fortunate circumstance that this engine was working from the near side: had it been otherwise, the fly-wheel, which from some imperfection in the key (which either fell out or broke) fled off the shaft, instead of alighting against the hedge, must have dashed into the group of spectators, causing a frightful loss of life. It may be said that this was quite an exceptional accident, but was it not in consequence of the excessive speed causing intense vibration that the key gave way?

Messrs. Howard, in Lot 4, made better work than Fowler, though here the pace was much faster than would be desirable for every-day work. The smoke-box and lower part of the funnel were nearly red hot, and would very soon have been burnt through, and the wear and tear must have been great. The implement travelled at a great pace, and coming in contact with a large stone the shock was sufficient to throw the driver with violence to the ground, where he lay for some minutes stunned and sick. The land was decidedly better moved than Lot 3, though here and there we found missed spots, and we should have preferred a somewhat rougher surface. 620 tons were moved per acre, the average depth being about 5¼ inches. It will be seen that the time occupied in actual work was nearly identical: had the time of getting up steam, setting down tackle, &c., been noted, Fowler would have gained somewhat. Here, again, as in all the other trials, Fowler's engines prove themselves the best constructed to economise fuel; this is probably due to the greater extent of heating-surface in the boiler in proportion to the horse-power. We hav

* In reference to this question, we may remark that the actual wear and tear on the boiler and furnace of an engine bears a close proportion to the amount of fuel consumed; thus the greater the latter, the greater will be the wear and tear.

on and Shuttleworth's engines consuming more than double the coal used owler's 7-horse engine.

e award as follows:—

rst Prize, 50*l.*, to John Fowler, for 7-horse Engine, Anchor, &c. (1541).
cond Prize, 25*l.*, to J. and F. Howard, for Apparatus (1608).

concluding this portion of our Report we would remark that, whilst the t of these trials proves incontestably that steam power can economically pete with horse labour, it is not so much in the mere saving of cost as in uperior quality of the work, and consequent influence on produce, that n asserts its superiority over animal power for strong soils.

CLASS III.

Ploughs for Steam Power.

essrs. Fowler, Howard, and Steevens entered in this class. The trials place on Friday, July 15th, in a portion of Mr. Jamieson's stubble field. srs. Savory's Double Windlass was used, and one of Messrs. Howard's hors. The draft was tested by a new and very beautiful Dynamometer, gned by Messrs. Easton and Amos specially for the Newcastle Show. Amos has kindly forwarded us the following description of this ingenious e of machinery: "In testing the traction force required to move culti- ng implements drawn by steam power, the ordinary dynamometer, which els over the land, is incapable of registering results correctly, owing to the varying resistance caused by irregularities of the surface. It therefore eared desirable that a fixed dynamometer should be constructed, capable of ectly registering the tractive force or strain caused by the resistance of the ivating implement on the wire rope, and giving the total amount of power used n experiment to overcome resistance, however variable that resistance might as regards time or intensity. These ideas were matured, and the result was Newcastle Dynamometer. The train of reasoning used in the invention of instrument was in conformity with the law of statics; thus, if a rope be sed over two pulleys placed some distance apart, and weights of unknown ount be fastened to each end of the rope, it is no difficult task to ascertain amount of the weights so placed. For if upon the rope, midway between two pulleys, we hang a known weight of any amount, it will cause the e to be deflected from a straight line; then all that is required is to multiply central weight in lbs. by the distance from the central weight to one of the leys, upon which the rope rests, in inches; divide the product by twice the exion of the rope, the quotient is the weight in lbs. of either of the weights ich tend to tighten the rope over the pulleys, or in other words, is the isure of the strain on the rope. The instrument consists of a strong oden frame, mounted upon carriage-wheels, having on its centre a strong t-iron vertical socket. A cast-iron screw column, fitted with a fly nut, drops this socket and moves freely in it, and the column can be raised or ered by the fly nut. To the top of the column is fitted a long arm of wood a joint at the centre, so that either end can be raised or depressed. The n thus possesses a movement both horizontal and vertical, like that of a nsit instrument. At each extremity of the arm a pulley is placed, which ns freely on vertical pins, the centres of these pulleys being 18 feet apart. the centre of the arm is a central pulley with vertical spindle, carried by strong springs. These springs are so placed that they deflect the central ley twelve inches out of a straight line between the other two. The rope ses over the end pulleys and under the central one, so that the deflexion of unloaded rope is twelve inches. The instrument being fixed in a position ween the engine and the Cultivator, the tractive force on the rope is shown

by the deflexion of the middle pulley becoming less. The greater the tractive force, the less the deflection of the rope. The results are accurately registered, however variable they may be both as to time and intensity." Without carefully prepared diagrams, which Mr. Amos has not had time to complete, it would be impossible to explain the arrangements by which the indicator works.*

As the Dynamometer was constructed to register only in one direction, the implement and rope was in each case drawn back with horses. The land was very rough, consisting of narrow high lands, across which the ploughs were drawn. This was a trial which severely proved the capacity of the implements for sticking to their work, and the way in which the soil was moved through the furrows was particularly noticed. Steevens' Plough did not maintain its depth, turned over a rather broken furrow, and often almost missed the low ground. We are more and more satisfied that this implement, highly ingenious though it be, is not yet strong enough for heavy land; it does not stick to its work either as a plough or cultivator should do. Messrs. Howard and Fowler both made much better work. The principle on which the Balance Plough is made, seems the best yet invented for general purposes. In this class Messrs. Howard exhibited a Two-furrow Plough, similar in construction to the ordinary plough, but intended to work at an extra depth. We have no doubt that in deep fen-land, or where, as in the South of France, very deep ploughing is desirable, this implement would prove very efficient. The subjoined Table will explain the actual results in each case.

Name.	Number in Catalogue.	Price.	Distance run in Yards.	Time occupied.	Draft of Plough in lbs.	Horse-power employed.
		£.		min. sec.		
Steevens	1310	65	98	1 10	1654·9	12·64
			84	1 20	1495·6	8·56
Fowler..	1544	97	107	1 28	1307·	8·73
			103	1 20	1357·9	9·6
J. and F. Howard	1609	80	96	1 25	1507·9	7·17
			95	1 15	1614·	9·84

The last column shows the average horse-power required to work each implement; one horse-power is by definition a force which will lift 33,000 lbs. one foot high in one minute.

Award :—

First Prize, 20*l.*, to John Fowler.
Second Prize, 10*l.*, to J. and F. Howard.
Silver Medal to W. Steevens, for Improvements in Steam Plough.
We Highly Commend J. and F. Howard for Two-furrow Plough (1611).

Class IV.

Cultivators for Steam Power.

This was one of the most interesting features of the trials, especially when we consider the importance of the Cultivator in relation to steam power. Five implements were entered for competition. Messrs. Howard's Engine, Windlass, &c. were employed, and one land of clover stubble given for each trial; the revo

* Diagrams and a full description of the Newcastle Dynamometer will appear in the next number of the Journal.

.utions of the engine being carefully noted in each case. The Dynamometer lescribed above was fixed a little distance from the engine, in such a position that the draft on the rope could be registered as the implements travelled up the land; each implement was allowed to proceed up and down in order to arrange the depth, the test was then applied, generally twice, the time accurately noted, and the distance measured through which the implement travelled. In each case a portion of soil was weighed, the width of work ascertained, and thus the actual draft for a given weight of soil moved was found. The work was laid bare right across each lot, so that the character of the bottom and the depth attained were apparent. In connection with this object we measured a square yard on the unbroken surface, and weighed the soil to a depth of six inches; the result was 3 cwt. 2 qrs. 15 lbs.; this will be some guide as to the depth disturbed by each implement.

Name.	Number in Catalogue.	Width taken by Implement.	Yards run.	Time occupied.	Draft in lbs.	Weight of a Yard Square.	Actual Horse-power employed.	Total Units of Power expended.	Earth moved, in Tons.	Units of Power required to move 1 Ton.
		ft. in.		M. S.		cwts. qrs. lbs.				
Howard A.	1607	3 5¼	130·6	1 15	3950	3 2 5	37·52	1547700	26·68	58009
Ditto B.			158·8	1 48	3982	4 0 7	31·43	1866942	37·18	50208
Fowler . .	1553	3 10	81·62	1 0	3176	3 1 24	23·55	777150	18·06	43024
			83·39	0 57	2892	3 1 24	23·9	749265	18·45	40599
Steevens . .	1310	2 10	85·14	1 0	2660	2 2 23	20·57	678810	10·87	62419
			86·24	1 0	2431	2 2 23	19·05	628650	11·02	57150
Coleman . .	549	3 10	91·0	1 0	4194	3 1 17	34·7	1145100	19·67	58209
			82·7	1 0	4699	3 1 17	34·57	1140810	17·97	63484
J. A. Williams	2037	3 0	79·4	1 0	3767	3 0 17	27·27	899910	12·51	71936

N.B. The unit of power is the force generated by 1 lb. falling through the space of foot; 1 horse-power is by definition a force which will lift 33,000 lbs. 1 foot high r 1 minute.

Lot 1.—Messrs. Howard worked their 3-tined Cultivator, first with narrow shares, and afterwards with broad shares. The results are lettered A and B in the preceding Table. The Cultivator consists of a ribbed wrought-iron frame, very strong, and is so arranged that the tines furnished with double points rock on the frame, so that as the points in work are depressed the hinder ones are slightly raised. The arrangements for altering the shares are not so simple as they might be, and caused a considerable delay. The narrow tines left a very uneven and ridgy bottom. The implement worked full 6 inches in the deepest parts, and the soil was moved at the rate of 857 tons per acre. The broad shares which cover all the ground left a more even bottom; and though they worked at the same depth, a greater weight of soil was moved, equal to 983 tons per acre. The width disturbed was in both cases 3 feet 5½ inches.

Lot 2.—Fowler, working the 4-tined balance Cultivator, made some excellent work. This implement was submitted to a second trial, as an objection was raised to the first experiment. The bottom was decidedly the most even of all the trials; the depth somewhat less than in Lot 1; 847 tons per acre were moved. The width stirred was 3 feet 10 inches. The lighter draft of the balance Cultivator is partly accounted for by the fact that this implement clears its way by getting rid of the soil, throwing it on one side, whilst other Cultivators cut their way through a dead mass of earth, which, as soon as disturbed, falls back, and checks the onward course of the implement. The surface was left in a good condition for after work.

Lot 3.—Mr. Steevens' combined implement, described before, worked with narrow tines, and left a most uneven bottom. It was explained to us that better work would have been made had broader shares been substituted. We have no doubt this would have been so; but why, then, was it not so exhibited? The Judges are called upon to decide on the merits of implements as they come before them. As it was, the work was decidedly bad. And in this rather hard soil we again had evidence that Mr. Steevens' implement is liable to shirk its work; probably the weight of the frame which carries the tines is insufficient to keep it quite steady. The soil moved was at the rate of 654 tons per acre, the width of the implement 2 feet 10 inches.

Lot 4.—Coleman and Morton's Cultivator made fair work; the bottom was, however, somewhat uneven, the tines being too narrow for this hard soil. In this case the draft of the empty implement was added, since the system requires two Cultivators—one in, and one out of work. Soil moved, at the rate of 823 tons per acre; width disturbed, 3 feet 10 inches. We were pleased with the work of this Cultivator on both occasions that it came before us, though we do not approve of a system that requires two implements to do only the work of one.

Lot 5 was occupied by Mr. J. A. Williams with his Leviathan Cultivator, an enormous implement, which covers 6 feet 2 inches between the wheels and disturbs 6 feet of ground. It consists of a strong rectangular frame on three wheels; two support the body, and one in front is used for steering. The frame carries a series of head-blocks, set perpendicularly by screws which regulate the depth of the forepart of the cultivating-shares. Three cultivating-frames are attached, each carrying three cast-iron coulters. The coulters are $3\frac{1}{2}$ inches wide, by $1\frac{1}{4}$ inch thick, bevelled fore and aft. Three descriptions of shares are provided—narrow chisels, broad chisels, and steel broad-shares, which cover all the ground. The cultivating-frames are independent of the carriage-frame, being raised out of the ground and kept to a given depth, or rather prevented from entering the ground too deeply by a lever-press; in other words, we have much the same arrangement as in the coulter of a drill, only the press is there employed to keep the coulters in the ground, and here to prevent their drawing in too deeply. The man steers from a seat on the carriage-frame; the implement turns at the land's end; it weighs about 1 ton. Mr. Williams' plan of cultivation consists in going twice over the same ground; the depth cultivated was very irregular. The frames, each acting as independent levers, jumped about a good deal, and kept rising and sinking as far as the press allowed, according to the obstructions in the soil. The soil moved was at the rate of 762 tons per acre. Width twice moved, 3 feet.

The Award was as follows:—

	£	s.	d.
First Prize to John Fowler	17	10	0
Second Prize to J. and F. Howard	12	10	0
Si'ver Medal to Coleman and Morton.			

Class V.

Trial of Steam Harrows.

These trials took place on Saturday, July 16th, the ground selected being the three lots ploughed by the competitors in Class II. The whole area, about 8 acres, was divided into five equal strips; lots were drawn, and each implement worked across the three ploughings. Messrs. Howard kindly lent their power, which proved very suitable for the work; after each implement had traversed a ... the large horse plough Dynamometer was attached, and

an observation taken in both directions. It will be seen that the draft was in each case greater when the implement was travelling from the engine.

Name.	Number in Catalogue.	Cost.	Description.	Distance run in Yards.	Time occupied.	Width of Land harrowed.	Draft in lbs.	Draft in lbs. per Foot in Width of Land harrowed.	Horse-power employed.
		£. s.			M. S.	ft. in.			
Kelsey . . .	2440	12 12	American triangular Harrow	Trial discontinued, owing to excessive draft caused by imperfect traction adjustments.					
J. and F. Howard	1614	30 0	Norwegian Harrow	170	2 20	6 10	1799	263·3	11·9
Ditto.	..	..	..	158	2 20		1744	255·2	10·7
J. and F. Howard	1613	22 0	Drag Harrow	165	1 55	10 0	1588	158·8	12·4
Ditto.	..	..	..	154	2 10		1521	152·1	9·8
Fowler . . .	1554	50 0	Ditto	157¾	2 5	11 7	1967	169·8	13·5
Ditto	..	..	..	162¼	2 5		1947	168·0	13·8
Ashby	2033	20 0	Double Circular Harrow	Trial discontinued, owing to breakage from imperfect traction adjustment.					

N.B. The last column shows the average horse-power required to work each implement.

No. 1.—Kelsey's Harrows are an American invention, of some merit, though not seen to advantage on this occasion, because the imperfect adjustment of the draft caused the implement to bury itself in the soil, and act as a Cultivator rather than a harrow. We consider the arrangement of the tines simple and good. The implement consists of a strong wooden frame, forming 2 equilateral triangles, one placed within the other. The teeth are so arranged as to cut the ground alternately in either frame, at equal distances apart; and it is evident that if it be properly balanced, nothing can escape the action of the teeth. It has never been tried before with steam-power. The inventor proposes to draw it backwards and forwards without turning: experience can alone decide whether this is practicable; we think in foul land the implement would clog up when the broad end of the triangle meets the soil. Should this be the case, an arrangement for turning might readily be introduced.

No. 2.—Messrs. Howard worked their Norwegian Harrow, consisting of three rows of star-shaped discs, working between each other, and thus completely comminuting the surface. This implement acts as a combined harrow and presser, pulverizing the surface, and at the same time consolidating the under soil. Crossing the rather open furrows of a clover ley, this implement was in its right place. It requires, however, a dry surface, and land free from stones, and its value is rather exceptional than general. The trial was very successful.

No. 3.—Messrs. Howard's Steam Harrows, made on the zigzag principle, and provided with a simple steerage and seat for the workman, are excellent implements for crossing fallows in the spring. The length of tines and weight of frame cause all these implements to work rather as Cultivators, cutting through the furrow, than as harrows proper. The width taken is so great that, in order to break fresh ground at each turn, the harrow has to start forward a short distance, then retrace its steps, and thus get into its proper track; practically we should double our work, and thus do away with this dodging backwards and forwards, and loss of time. Looking at the

moderate cost of these drag-harrows, the quantity of work they could accomplish, the quality of the operation, and their adaptation for any kind of steam power, we think Messrs. Howard have produced a very valuable implement.

No. 4.—John Fowler's Steam Harrows are provided with slack-gear; they are attached to and work between the fore and hind wheels of a carriage which carries the slack-rope drums. The weight of this carriage is considerable, and the pressure of the hind wheels upon the work a disadvantage. The cost of the implement is also an objection; 50*l.* is too much to pay for such a tool. The work was very good, the surface more broken than No. 3, due to the fact that the teeth, whilst somewhat shorter, are nearer together.

No. 5.—Mr. Ashby tried an enormous pair of rotating harrows, of great weight, furnished with strong round tines; the diameter of the two harrows, and consequently the width of soil they would disturb, was 13 feet 8 inches. So great was the power required to move these harrows in the form they assumed at the trial, that the iron bar to which the rope was fastened was bent double without the implement being moved. Mr. Ashby informed us that it was intended to attach them to Fowler's slack-gear carriage, and thus the depth and draft could have been properly regulated. Unfortunately, time did not allow of a second trial. In reference to the very interesting figures resulting from the Dynamometer tests, the two last columns are the most important, showing the actual draft for every foot in width harrowed, and the average horse-power required to work each implement. We think it is clear that whilst dragging may be in some instances economically substituted for cultivating, horse-power will have the advantage for harrowing operations.

We award the Prize of 20*l.* to J. and F. Howard.

Class VI.

Windlasses and Application of Power thereto.

The object of the Society in offering this prize was to ascertain by which system of *haulage* a given amount of work was performed with the least expenditure of power. We understand that our decisions have been objected to in some quarters, under the idea that a windlass can only refer to machinery on which a rope is wound, and therefore that a clip-drum cannot be a windlass. Those, however, who arranged the wording of this prize, and who are eminently qualified to decide this point, considered that any machinery by which the rope is hauled and enabled to draw an implement through the soil is to all intents and purposes a windlass, and eligible to compete in this class. These trials, as well as those for Cultivators, were unavoidably delayed until Monday, July 18. This was in one respect an advantage, as the superior attractions of the Show Yard secured us a clear field, which was of the utmost importance, and the progress of the work, after the preliminaries had been arranged, was most satisfactory, affording a striking contrast to our experience in Class III., when the trials were frequently impeded, and at last put a stop to, by the crowding of spectators. Once again we venture to make a suggestion. It is that Dynamometer trials should take place before the public trials are announced. There were several very interesting points that we would gladly have investigated, but time did not permit. Mr. Amos arranged these trials in the following manner. Mr. Fowler's 14-horse Engine drove each of the windlasses in succession through the large 50-horse power Dynamometer. The windlasses were detached from the working parts (piston and slides, &c.) of each engine, so that the draft registered indicated the actual power required by each system of *haulage* to perform a given quantity of work. Fowler's Three-furrow Plough was used, working at a fixed depth 7 inches, and taking a regular furrow 10 inches in width. It is therefore

evident that so long as the speed was equal, and the same amount of soil moved in each case, the result must present a true verdict. There were four competitors, Messrs. Coleman and Morton, W. Savory and Son, with the double Windlass Engine, John Fowler, and J. and F. Howard. The draft was taken in both directions, except in the last turn with Messrs Howard's Windlass, when one of the plough-shares came in contact with a fast stone, the body or skife broke; and the lateness of the hour, 8·30, prevented any further trial.

Having ascertained the upward draft, we could easily make deductions for the lighter draft when coming down hill, similar to those which the other trials warranted.

Name.	Number in Catalogue.	Distance run in Yards.	Time occupied.	Actual Horse-power employed.	Cubic Feet of Earth moved.	Total Units of Power expended.	Units of Power Expended in moving 1 Cubic Foot of Earth.	Direction run.
			M. S.					
Coleman and Morton .	548	128	2 0	11·86	560	782760	1397·7	Uphill.
Ditto. .	..	138·8	2 10	11·36	607·25	809740	1333·4	Down.
Savory and Sons . .	708	140·5	1 30	21·04	614·6	1,041480	1694·5	Uphill.
Ditto. . .	..	145·4	1 25	20·00	636·1	934560	1469·2	Down.
Fowler	1541	141·9	1 55	14·6	620·8	923128	1486·9	Uphill.
Ditto	..	151·8	1 55	13·1	664·1	859900	1294·8	Down.
Howard	1608	131·3	1 55	14·6	574·4	923128	1607·1 1398·6 (as estimated).	Uphill. Down.

The reader's attention is requested to the actual horse-power employed, and the units of power required to move 1 cubic foot of earth. It may be well to notice that in Fowler's case the winding apparatus of a 7-horse engine was employed, and yet the power required to work a 3-furrow plough was equal to 14 horses. Howard's windlass, to be driven by a nominal 10-horse engine, takes also 14-horse power. So much for nominal horse-power! We gather from these experiments the importance of having plenty of power. This horse-power, however, must not be taken as representing the exact power that would be consumed, because the question is affected by the speed arrangements of the different systems.

We made the following awards:—

First Prize	to John Fowler	.. ..	£15
Second	„ J. and F. Howard	.. .. ..	10
Third	„ W. Savory and Sons	.. ..	5

Class VII.

Steam Anchors.

There was very little competition in this class. The only novelty that was exhibited being Collinson Hall's Anchor, already described; and as he withdrew his apparatus from competition, we had no opportunity of testing its merits. The Anchor arrangements of Messrs. Fowler, Howard, and Coleman, were brought thoroughly under our notice in the various trials, and we had no difficulty in deciding that a Self-moving Anchor was in principle superior to any other, and therefore awarded the—

Prize of 20*l.* to John Fowler.

Class VIII.

Rope-porters.

Messrs. Aveling and Porter's Travelling-carriages, and some improvements in the ordinary Porters by Messrs. Coleman and Morton, were the only novelties in this class.

The Travelling-porters are intended to carry the *implement* rope, the outer rope being best carried by the ordinary three-wheel porters. The object is to save friction of the rope and labour to the boys, who are placed at either end of the work, and have to unhitch or hitch on the porters as the case may be.

Mr. Aveling worked them on Saturday with Messrs. Garrett's Double Engines, the single rope of this system showing them off to advantage. On level land they answer admirably, saving the rope considerably—strong lads are required to manage them. The carriages consist of two light travelling-wheels supporting a hollow iron rod (one-inch gas-pipe), with a V clip at either end. One end terminates in a handle, and the other in a coil, which passes round the rope, and allows of the rope being picked up, so to speak, whilst in motion, and it is held tight by the V clips, which are worked by a trigger-piece. The arrangements are so good in this respect that the porter and rope appear as one, and away it runs over rough ground or smooth, jumping about, it may be, but never becoming detached. In working very hilly land this system would not answer so well, as in such cases we often require a fixed porter at a certain point, to prevent the rope grubbing on the ground. These carriages cost 3*l.* a-piece, and as 6 to 8 would be required in a length of 350 yards, besides as many large porters for the outer rope, the expense is therefore considerable. If, however, a real saving in the rope is effected, which experience can alone decide, this is not a material point, and we consider the Travelling-porters an ingenious and promising invention.

Messrs. Coleman and Morton exhibit improvements in both small and large porters, which are deserving of notice. The friction-wheel on the large porter is hung upon an upright, that has sufficient play to allow of the wheel inclining to any moderate angle according to the stress of the rope. If, as is not unfrequently the case, the porter is set down badly or pushed out of its course, the pulley-wheel adapts itself to the direction of the rope and undue friction is avoided.

In the small porter, the pulley-wheel works loose on the axle, which is of some length. When at work the inclination of the axle causes the pulley to remain close to one side; when, however, the rope is to be caught, the pulley slides to the opposite end of the axle, where a guide iron is fixed, which directs the rope on to the wheel. This ingenious arrangement appeared to work satisfactorily.

Our Award was as follows:—

0*l.* to Messrs. Aveling and Porter, for Travelling-porters.
5*l.* to Messrs. Coleman and Morton for Improvements in ordinary Porters.
Highly Commended. John Fowler.
Commended. J. and F. Howard.

In conclusion, we may state that the great feature of the Newcastle Steam Trials, as indicating progress since the Worcester Meeting, consists in the use of two engines working simultaneously. The Double Engine system appears now to be fairly started, and likely for many purposes to supersede the Anchor arrangements. Nor must we forget that the clip-drum is the parent of this system, for with no other windlass used for steam cultivation could it have been possible. We may notice the high finish of Messrs. Fowler's and Howard's machinery and the increased strength of the various parts to bear

'ain, as proved by the fact that throughout these extended trials no accident occurred to either of these makers. Messrs. Garrett's Engines vory's patent) are improved since last year. Their great weight, costli- ınd heavy consumption of fuel, incline us to believe that they are ə of still greater improvement.

cannot conclude this Report without tendering our sincere thanks to the 'ds of our Department for their kindness and courtesy, and for the ıg energy they displayed in bringing these Trials to a successful con- ı; nor must we omit to offer our public thanks to Mr. Amos and n, for the excellence of their arrangements, and for the courtesy and on with which our suggestions were received and acted upon: the nteresting features of this Report, viz., the tabulated results of delicate ometric tests, are entirely the result of their exertions.

D. K. Clark, C.E.
H. B. Caldwell.
Clare Sewell Read.
Francis Sherborn, Jun.
John Coleman.

Report of the Judges on Horse Ploughs, &c., at Newcastle.

prizes offered by the Royal Agricultural Society in this department s follows:—

		£
For the Class of	Wheel Ploughs	30
„ „	Swing Ploughs	30
„ „	Subsoil Ploughs	10
„ „	Paring Ploughs	10

ısidering it desirable that the competition of Ploughs should be arranged ·ee divisions, viz., Light Land Ploughs, General Purpose Ploughs, and hs for heavy land, we visited the stands of the various makers, and ed such implements as appeared most suitable for competition; these from all parts of the kingdom, from Huntley in the north, to Essex in ›uth, and included

10 Wheel and 5 Swing Ploughs for light land
10 „ 10 „ „ general purposes
10 „ 2 „ „ heavy land
6 Subsoil, and 4 Paring Ploughs.

ɜides the above, we tested six Digging Ploughs and a Ridge Plough, and so inspected the work of a combined Plough Drill and Harrow.

e field selected for the trials was a clover stubble at Long Benton, nting an even surface; the soil, a strong clay loam, with stones inter- l, was uniform in character, and rested on a stiff clay subsoil. The dry condition of the soil caused the trials to be very severe, and well lated to show the capabilities of the different implements under ılties.

Class I.—Light Land Ploughs.

Wheel Ploughs.—In this division, as before stated, ten ploughs were selected for trial. After seeing these at work for some time, and carefully examining both the implements and their work, while in progress and at its completion, we selected four to be further tested by the Dynamometer.

In carrying out these interesting experiments we had the assistance of one of Mr. Amos's aide-de-camps, Mr. Geoghegan, to whom our thanks are due for the care and patience he displayed in overcoming difficulties caused partly by the hard state of the ground, and partly by the crushing and crowding of spectators. The following table gives these results:—

Name.	Number in Catalogue.	Price.	Distance in Yards run.	Dimensions of Furrow.	Cubic Feet of Earth removed.	Time occupied in Experiments.	Draught of Plough in lbs.	Actual Horse-power employed.	Total Units of Power expended during Experiments.	Units of Power to remove 1 Cubic Foot.
		£ s. d.		" "		min. sec.				
J. and F. Howard	1615	5 5 0	70	8·5×5	123·9	1 20	335·3	1·68	140828	1136·6
Ditto.	,,	,,	70			1 12				
Ransome and Sims	1758	4 15 0	70	8·5×5	123·9	1 8	258·2	1·49	108444	875·25
Ditto.	,,	,,	70			1 4				
W. Ball and Son	2382	4 14 6	72	8·5×5	127·5	1 7	315·9	1·83	136468	1070·5
Ditto.	,,	,,	72			1 9				
Hunt and Pickering	1662	4 12 0	65	8·5×5	120·4	1 4	264·4	1·48	107873	895·9
Ditto.	,,	,,	71			1 8				

Note.—The unit of power is the force required to lift 1 lb. 1 foot high.

Swing Ploughs.—Of the five ploughs selected, only four started. Of these, that of Messrs. Ransome and Sims, marked 1779 in the catalogue, and costing 3*l.* 17*s.* 6*d.*, made such decidedly superior work that we considered any further test unnecessary.

We award as follows:—

		£	s.	d.
To Messrs. Ransome and Sims for Wheel Plough (1758)	..	7	10	0
,, ,, ,, Swing Plough (1779)	..	7	10	0

We highly commend Messrs. Howard's Wheel Plough (1615).
,, commend W. Ball and Son's Wheel Plough (2382).
,, ,, Messrs. Hunt and Pickering's Wheel Plough (1662).

Class II.—General Purpose Ploughs.

Wheel Ploughs.—We tried ten ploughs in each division of this class, which as might be anticipated, was most attractive to the numerous spectators. It is manifest that an implement capable of economical work in soils, light and heavy, and equally available for shallow or deep work, will be more sought for than such as are suitable to particular cases only. We tried these ploughs at two depths, first at 5 inches, and afterwards at 7 inches, and such was the condition of the soil, that it was quite sufficient work for two powerful horses to draw the implements at the latter depth. We selected six ploughs for further testing; the result is contained in the following table:—

	Number in Catalogue.	Price.	Distance run in Yards.	Dimensions of Furrow.	Cubic Feet of Earth removed.	Time occupied in Experiments.	Draught of Plough in lbs.	Actual Horse-power employed.	Total Units of Power during Experiments.	Units of Power expended to remove 1 Cubic foot of Earth.
		£ s. d.		" "		min. sec.				
ims	1761 ,,	5 0 0 ,,	70·5 71	9·5×6·5	182·03	1 22 1 26	487·19	2·23	206,812	1136·1
rd	1617 ,,	5 10 0 ,,	71·5 71	9·5×6·5	183·02	1 19 1 16	462·15	2·32	197,569	1077·7
. . . .	399 ,,	4 10 0 ,,	71 74	9·5×6·5	186·5	1 15 1 19	528·4	2·72	229,854	1232·4
. . .	572 ,,	5 7 6 ,,	59·5 71	9·5×6·5	167·8	1 22 1 28	549·4	2·30	215,090	1281·8
ring	1663 ,,	5 2 6 ,,	71 70·5	9·5×6·5	182·03	1 15 1 22	483·5	2·37	205,245	1127·5
n . .	2380 ,,	4 14 0 ,,	71 70·5	9·5×6·5	182·03	1 20 1 21	458·8	2·21	194,760	1069·9

se tables, which have been carefully prepared for us by Mr. Amos, 1 many interesting points. The small amount of variation in the it of the several ploughs shows how nearly perfection has been attained ir construction. The last column, which may be said to sum up all st, deserves special attention, as enabling us to make the most complete act comparison of the actual draught of the different implements when ing a given quantity of earth. The unit of power spoken of is the required to lift 1 lb. one foot high.

ng Ploughs.—In this division we proceeded in a precisely similar manner, ig the implements at two depths, and carefully examining every point. lected three for the Dynamometer test, the result was as follows :—

	Number in Catalogue.	Price.	Distance run in Yards.	Dimensions of Furrow.	Cubic Feet of Earth.	Time occupied in Experiments.	Draught of Plough in lbs.	Actual Horse-power employed.	Total Units of Power expended during Experiments.	Units of Power expended to remove 1 Cubic foot of Earth.
		£ s. d.		" "		min. sec.				
Sims	1781	4 2 6	73·5	9·5×6·5	94·5	1 22	556·1	2·72	122,620	1297·5
ard	1620 ,,	5 2 6 ,,	73 72	9·5×6·5 ,,	186·4	1 37 1 25	608·5	2·64	264,697	1419·2
Co.	2935 ,,	4 10 0 ,,	72 65·5	9·5×6·5 ,,	176·8	1 26 1 12	546·4	2·82	225,390	1274·8

ansome and Sims's first run was lost by the plough being stopped by a large stone.

would here remark that too much stress must not be laid upon the nometer tests of the swing ploughs, as owing to the hardness of the d, and the absence of wheels to steady the implements, the draught was mequal, and even with wheels great difficulty was experienced in obtain- equal draught throughout. Indeed, we very much doubt whether it is le, with horse-power, to obtain in hard or stony land an absolutely correct from the Dynamometer. A little difference in the holding of the 1, or the height of the horses acting on the hold the driving-wheel of the

Dynamometer takes of the ground, may make a considerable difference in the result. To make these tests thoroughly reliable, we would suggest that the ploughs, when being tested, should be drawn by steam-power, so that not only might furrows of uniform depth and width be turned, but turned in exactly the same time, and with the same pressure on the wheel of the Dynamometer.

We award as follows:—

		£
To Messrs. J. and F. Howard, for Wheel Plough (1617)	.. ..	15 0
,, Ransome and Sims, for Swing ,, (1781)	.. ..	15 0

We highly commend Ransome and Sims for Wheel Plough (1761).
,, ,, W. Busby and Co. ,, ,, (399).
,, ,, Seaman and Co. ,, ,, (572).
,, ,, J. and F. Howard, for Swing ,, (1620).
We commend M'Gregor and Co. ,, ,, (2935).
,, ,, William Ball and Son for Wheel ,, (2380).

CLASS III.—HEAVY LAND PLOUGHS.

Wheel Ploughs.—Of the ten implements selected in this division of Class III. only eight started, two exhibitors declining to compete when they understood the nature of the work they were expected to perform, viz., to turn a furrow from 9 to 10 inches deep, and thus move, in most cases, a couple of inches of the hitherto undisturbed subsoil. The work generally was good, but we must specially notice that performed by Messrs. Ransome's Implement (1764), price 6*l.* 10*s.*, which was most excellent. Messrs. Howard's (1619), price 7*l.*, and Messrs. Ball's (2384), price 5*l.* 12*s.*, also did very good work, whilst Messrs. M'Gregor and Co., exhibited a strong useful plough (2933), price 7*l.* 2*s.* 6*d.*

At the request of the Messrs. Howard we tested theirs and Messrs. Ransome's ploughs, with the following result:—

Name.	Number in Catalogue.	Price.	Distance in Yards run.	Dimensions of Furrow.	Cubic Feet of Earth removed.	Time occupied in Experiments.	Draught of Plough in lbs.	Actual Horse-power employed.	Total Units of Power expended during Experiments.	Units of Power expended to remove 1 Cubic foot of Earth.
		£ s.		" "		min. sec.				
J. and F. Howard	1619	7 0	73	15×10	468·75	1 6	1361·5	8·19	612,675	1307·[illegible]
Ditto.	,,	,,	77	15×10		1 10				
Ransome and Sims	1764	6 10	73	15×10	459·	1 12	1234·4	7·08	544,370	1185·[illegible]
Ditto.	,,	,,	74			1 8				

In these trials the ploughs were drawn by four horses, but when the Dynamometer was applied six horses were used, in order that the team might be fully up to their work; the four horses had plenty to do, but the six did their work easily.

Swing Ploughs.—Of the two implements selected for this trial only one started, Messrs. M'Gregor and Co.'s (2934), price 6*l.* 7*s.* 6*d.* As this plough made good work, and appeared to be a strong, useful implement, we considered it deserving of the prize.

Our award was as follows:—

		£ s. d.
To Messrs. Ransome and Sims, for Wheel Plough (1764)	..	7 10 0
,, M'Gregor and Co., for Swing Plough (2934)	..	7 10 0

We highly commend Messrs. Howard for Wheel Plough (1619).
,, ,, Balls, for Wheel Plough (2384).
We commend M'Gregor and Co. for Wheel Plough (2933).

Before leaving this part of our subject, we would direct attention to the wheel fittings and fastenings of Messrs. Seaman and Co., in which are combined, strength, simplicity of construction, and saving of friction. The straight axle used by Messrs. Ransome and Sims is also strong and simple. The result of these trials convinces us, and, we believe, the public also, that either in deep ploughing, or when the land is hard and baked, as it was at Long Benton, Wheel Ploughs are greatly superior to Swing Ploughs.

CLASS IV.—SUBSOIL PLOUGHS.

There were six entries in this class. After a careful trial we decided that Mr. Bentall's implement (306), price 4*l.* 4*s.*, was the most efficient, breaking up the subsoil thoroughly; and, consequently, the prize of 10*l.* was awarded to him. We also commended the plough exhibited by Messrs. Ransome and Sims (1786), as coming nearest to it in efficiency.

CLASS V.—PARING PLOUGHS.

There were four entries; the prize of 10*l.* was awarded to Messrs. Hunt and Pickering, for article (1669), price 5*l.* 10*s.* No premium was offered by the Society for diggers, but we believe that a really efficient implement of this kind, capable of effecting, by horse power, work similar to that known as "Smashing" by steam, would prove a boon to small occupiers. We tried five implements. Of these we highly commend *Cotgreave's Subsoil Fen-land and French Plough* (1785), price 10*l.* 10*s.*, as a most efficient implement, which tills and pulverizes the soil at one operation, and is highly valuable for a certain class of soils. We also commend *Ransome and Sims's Solid Beam Iron Plough*, V. R. (1772), price 5*l.*, as, in some measure, coming up to our idea of a digger. In connexion with this kind of work we must notice *Messrs. Hancock's Pulverizer Plough* (2456), price 6*l.* 10*s.*, to which we awarded a silver medal. We saw this implement at work more than once; although it was not exhibited in this class.

Messrs. Hancock's idea is to produce a seed-bed at one operation; this they effect by attaching to their frame three separate cutting shares, each furnished with a short mould-board, the front share entering the soil, say 2 inches, the second four, and the third 6 inches, or in this proportion up to whatever depth the implement is set. It will be readily understood that the soil thus broken up as it were by degrees is rendered very fine and light, and the work performed was excellent. We regret that the draught of this implement was not compared with that of the ordinary plough working at the same depth.

With slight modifications, the strengthening of some parts of the implement, and the use of malleable iron shares, we believe that Messrs. Hancock will have produced an efficient "Smasher," which will prove valuable to those who cannot attain to steam cultivation. We also saw at work, and highly commended Mr. J. G. Harrison's double Mould-board or ridging Plough (3646). This implement was fitted with an improved share, to be used in ridging up stubble on strong land. We also had our attention called to a *combined Plough-Harrow and Drill*, invented by Mr. L. L. Sovereign, of Canada (2421), price 25*l.*, in which there are several points of interest and ingenuity. On light land, where a seed-bed is easily made, this may prove a useful implement.

In conclusion, we beg to tender our thanks to the stewards and their assistants (not forgetting Mr. Gibson, our field foreman, who was most attentive and active in the performance of his duties) for their attention to all our requirements, and especially for the manner in which horses were provided for the various trials, by which our work was essentially forwarded.

Signed THOMAS P. OUTHWAITE.
EDWARD WORTLEY.
THOMAS P. DODS.

Newcastle-on-Tyne, July 22, 1864.

Report of the Trial of Cultivators, Clod Crushers, Plain Rollers, and Harrows.

We selected for trial 22 cultivators, 8 clod crushers, 17 rollers, and 41 sets of harrows, in all 88 implements; each of these had to be conveyed a distance of four miles to the trial-ground, where many of them were tried in two and several in three different fields. The time thus allowed for testing the merits of each implement was consequently very limited. The trials may thus have appeared less satisfactory than if more time could have been allowed the exhibitors to adjust and work their respective implements.

Speaking generally of the implements which came under our notice, we feel that great praise is due to the exhibitors for the great improvements which have been accomplished in their manufacture, particularly in the quality of the materials used, and the hardening the points, &c., most exposed to wear and tear. Although many of the attempts at novelty of construction may not have been so successful as could have been desired, the exhibitors show a commendable spirit in endeavouring to give practical effect to any new conception or suggestion.

The first trials coming under our consideration were the

Cultivators.

Out of the 22 selected, 13 were tried with broadshares on a piece of foul land rendered very hard by the dry weather. Under this severe trial many of them made very fair work. These were again tried with points, along with the remaining 9, working as grubbers or scarifiers on a piece of clean fallow. Here they nearly all worked well.

The construction of these implements was very varied, no two of them being alike, so likewise was the force required to work them, which ranged from 1 to 6 horse-power. This made it a difficult task to decide on their merits; but considering that a plain, strong, simple, and well-manufactured implement was the "desideratum," we awarded a prize of 12*l.* to Mr. Bentall, 10*l.* to Messrs. Coleman and Morton, and 8*l.* to Mr. Charles Clay. We also highly commended Messrs. Coleman and Morton's cultivator for large occupiers; and commended Messrs. Corbett and Sons' implement.

Clod Crushers.

Eight were selected for trial in this class, being worked on a piece of rough fallow well suited for the purpose. Several of them made excellent work, and after testing the draught of four of the best of them by the dynamometer, we awarded a prize of 9*l.* to the Beverley Iron and Waggon Company, 6*l.* to Messrs. Crosskill and Sons, and 5*l.* to Mr. Cambridge; we also highly commended Messrs. Amies and Barford's implement.

Rollers.

There were 17 selected for competition, most of which showed great im- provement in their construction, from the judicious substitution of wrou- for cast iron both in the cylinders and frames; and also from their being m- up of segments instead of one whole cylinder, a change which enables them turn more easily, and to work much more effectually where the surface is even. Improvements were also made in the mode of fixing the bearings that they could be removed without the necessity of taking the frame pieces.

We considered the Ballasting Rollers, exhibited by Messrs. Amies and Barf- -, superior. They were entirely of wrought iron, and were composed water-tight cylinders which can be loaded at pleasure—thus securing a l- and heavy roller in one implement. Our instructions only allowed us 10*l.* class, which we apportioned by awarding a prize of 7*l.* to Messrs. A- Barford and 3*l.* to the Beverley Iron and Waggon Company. We al-

highly commended the Roller No. 1986, exhibited by Messrs. Amies and Barford; and commended those exhibited by Messrs. Crosskill and Sons, Hill and Smith, and Hunt and Pickering.

Harrows.

There were 41 sets selected for competition, comprising all sorts of harrows for light and heavy land. This class of implement is, perhaps, more remarkable for varieties in construction than any other; besides the well-recognised zigzag harrow, they came before us under the different appellations of Combined Harrow and Scarifier, Lever, Scuffling, Rotating, Jointed, Chisel-toothed, Duck-footed, Excelsior, Flexible, Chain, Extirpator, &c.

The first trial took place on a piece of very foul land that had been broken up by the cultivators with the broadshares, and was so severe a test that very few of them could get through their task without choking. The next trial was on a piece of clean fallow which had been ploughed a few days previously. Here they all, whether designed for light or heavy land, made such good work that we found it necessary to select a few of the implements for a third trial on a piece of clover-ley which had been ploughed by steam. This answered the purpose admirably. The large number and the great variety of these implements render it impossible fully to discuss in detail, in this Report, the merits of their different modes of construction; several among them, although not mentioned in our awards, are well deserving of notice, and would prove very useful on suitable land. It being our duty to consider what implements were best adapted to the country at large, we awarded three prizes of 8*l.*, 7*l.*, and 5*l.* to Messrs. J. and F. Howard for their three sizes of harrows. We highly commended the jointed harrows exhibited by Messrs. Ransome and Sims, also the flexible or chain harrow exhibited by Messrs. J. and F. Howard, and the chain-harrow exhibited by Mr. Cambridge.

Schedule of Awards.

Number of Implements Tried.	Catalogue Number.	Price of Implements. £. s. d.	Exhibitor's Name.	Amount of Prizes. £.
Cultivators. 22.	308	7 7 0	Mr. Edward H. Bentall	12
	550	7 10 0	Messrs. Coleman and Morton	10
	359	11 11 0	Mr. Charles Clay	8
	554	13 10 0	Messrs. Coleman and Morton	Highly Commended.
	3989	9 10 0	Messrs. Samuel Corbett and Son	Commended.
Clod-crushers. 8.	1404	18 10 0	The Beverley Iron and Waggon Company	9
	376	18 10 0	Messrs. Willm. Crosskill and Sons	6
	1493	15 0 0	Mr. William C. Cambridge	5
	1981	18 10 0	Messrs. Amies and Barford	Highly Commended.
Rollers. 17.	1983	18 10 0	Messrs. Amies and Barford	7
	1405	15 10 0	The Beverley Iron and Waggon Company	3
	1986	14 0 0	Messrs. Amies and Barford	Highly Commended.
	378	11 11 0	Messrs. Willm. Crosskill and Sons	Commended.
	643	10 10 0	Messrs. Hill and Smith	Ditto.
	1674	10 10 0	Messrs. Hunt and Pickering	Ditto.
Harrows. 41.	1647	4 0 0	Messrs. Jas. and Fredk. Howard	8
	1649	6 6 0	Ditto Ditto	7
	1643	3 12 0	Ditto Ditto	5
	1795	7 7 0	Messrs. Ransome and Sims	Highly Commended.
	1652	4 0 0	Messrs. Jas. and Fredk. Howard	Ditto.
	1498	5 0 0	Mr. William C. Cambridge	Ditto.

John Thompson.
John Hicken.

Report on Miscellaneous Implements and Brick and Tile Machines. Newcastle, 1864.

THE principal Implement-makers were well represented at this Meeting. The entries were not, however, so numerous as at Worcester, and it did not appear to us that there were many new Implements deserving of special remark; but we observed throughout the show, in various departments, many signs of progress and improvement in mechanical details. Out of 207 exhibitors, we found that Newcastle and neighbourhood, with the country to the north and west of it, included the names of 32 only. Of these, Newcastle sent 5; Northumberland, 8; Berwickshire, 2; Edinburgh and Kelso, 1; Glasgow, 1; Carlisle, 6; Ayrshire, 2; Aberdeenshire, 2; Stirling, 2; and Penrith, 3.

The Excelsior Grain Separator (No. 3 size), 1070, invented by A. B. Childs, and manufactured by Riches and Watts, is a very effective machine, combining the action of blast, riddles, and exhaust. The price is high, 40*l.*, but its great utility more than compensates for this. Having subjected the machine to the dynamometer test, we found the power consumed moderate, and accordingly awarded Mr. Childs a *Silver Medal* for this valuable machine.

The American Grist Mill (1065), price 26*l.* 10*s.*, invented by Amory Felton, of Troy (U.S.A.), and exhibited by Riches and Watts, is in our opinion the best metal mill that has yet been brought before the public. It consists of a chilled cast-iron fluted cone, working within a cylinder of the same material and shape. The arrangements for feeding the mill appear to be good. The working parts when worn out are renewable at a trifling expense. Having thoroughly tested this machine with the dynamometer, and made various experiments, we had much satisfaction in awarding it a *Silver Medal*.

Amies and Barford exhibited a fan attached to a chaffcutter, by which the cut chaff is driven through a spout in any required direction. The arrangements include the boxing up of all the working parts, which are thus preserved from dust, whilst accidents to the workmen are guarded against; to this invention we gave a *High Commendation*, believing that in many situations it may prove very useful.

In the class of Reaping and Mowing Machines there were many improvements in details, and we are led to infer that the next trial of these machines under the auspices of the Society will be attended with more than ordinary interest.

To Messrs. Burgess and Key, we awarded a *Silver Medal* for their set of draining tools, which were well made and useful.

BRICK MACHINES.

The competitors in this class were Messrs. Whitehead, Pinfold, Sharp and Bulmer. The following table gives the results of the trials:—

Name.	Number in Catalogue.	Price of Machine.	Horse-power required to Drive Machine.	Quantity of Manufactured Clay expressed per Minute in lbs.	Quantity of Manufactured Clay expressed per each Horse-power in lbs.
		£.			
Whitehead	305	39	7	542·166	77·452
Pinfold	3907	165	5	447·	89·4
Sharp and Bulmer .	3900	60	Machine badly managed, and trial discontinued.		

It will be seen that of the two machines tried, Pinfold's expressed rather more clay in proportion to the power consumed than Whitehead's. The bricks produced were neither so good nor well finished; and looking at the great difference in the price of the two machines, we felt justified in awarding the

first prize of 10*l.* to Mr. Whitehead; Mr. Pinfold received the second prize of 5*l.*

TILE MACHINES.

Only two machines were exhibited, one by Mr. Page, and the other by Mr. Whitehead. The former not being fitted with a pulley, according to the published requirements of the Society, could not be tested, and we must leave the public to draw their own conclusions. We gave Whitehead's machine a severe trial with very inferior clay, its work was satisfactory, and we awarded it the prize of 5*l.*

1st Experiment.

Name.	Number in Catalogue.	Price of Machine.	Weight of Clay Screened.	Fuel.	Time in Screening.	Total Units of power expended.	Units of Power to Screen 100 lbs. of Clay.
		£.	cwts. qrs. lbs.	cwts. qrs. lbs.	minutes.		
Whitehead .	295	21	7 0 0	1 0 16	20	69·425	10·583

2nd Experiment.

Name.	Net Weight of Clay Screened.	Time.	Number of Tiles, 13¼ in. long.	Total Units of Power expended.	Total Units of Power for 100 ft. of Tiles.	Length of Tile made per Minute.
	cwts. qrs. lbs.	min. sec.				feet.
Whitehead .	5 3 12	18 30	174	55·315	28·257	10·52

W. TINDALL.
GILSON MARTIN.

XXIV.—*Report to the Council on the Cattle Exhibited at Newcastle.* By J. DENT DENT, M.P.

FOR many years the Royal Agricultural Society confined its prizes for cattle to Shorthorns, Herefords, and Devons, and placed all other established breeds together in one class. At various meetings local committees offered special prizes for breeds not distinguished by the Society, and in 1862, at the Battersea show, the Society itself extended its list of premiums to most of the established breeds of England and Wales. Last year at Worcester the Sussex cattle were thus distinguished; and this year's prize list included special classes for Sussex, Channel Islands, Scotch Horned, Polled, and Ayrshire cattle, in addition to the class for other established breeds. It seems to me to be one of the first duties of the Society, not merely to encourage our standard breeds of cattle, but in each locality which it visits, to offer prizes that may bring out the very best specimens of the races which are found most suitable to the district; and a little care in the arrangement of the prize-list will enable us to do this without much additional

expense, or the risk of a show of inferior animals. In the present case, the Scotch classes were inadequately filled, as far as numbers go; and this may be partly attributed to the fact, that our prize-list was not advertised in the Scotch papers. I would advise that for the future the prizes which are to be given for local breeds should be made known more generally in the district, and that paying more regard to locality, we avoid giving such prizes, as for Sussex cattle in the north, or for Galloways in the south.

But while we have been doing our utmost to increase the supply of beef, by developing the meat-producing qualities of animals, I think we have been neglecting very much their milking properties. No doubt the price of beef has been steadily advancing, but so have the prices of butter and of milk. Ireland used to be a great source of supply of butter to our markets; but in that country, since 1859, the milch cows have been diminished by 295,996, and we are scarcely yet sensible of the full effect of the diminution of live stock which has there taken place; * and in all probability the prices will rise still higher than at present. This falling off in our supplies of production is already telling on the prices of foreign butter as well as meat. The butter which in 1854 was only valued by the Customs at 4*l.* 5*s.* per cwt., has, during the last two or three years, been at 4*l.* 15*s.*, and this, too, during the period of Lancashire distress, when a large proportion of our best-consuming population was out of work; and the quantity imported, which was 425,663 cwt. in 1859, in 1863 was 986,708,† while, from the marked preference given to fresh over salted butter, we may safely infer a yet greater rise in the value of the produce of our home dairies; and, indeed, I find that the produce of my own dairy, which is bought for the Leeds market, averaged in 1852, 5*l.* 12*s.*; in 1862, 6*l.* 1*s.* 4*d.*; and in 1863, 6*l.* 10*s.* 8*d.* per cwt.

It may be no easy matter for the Society to offer prizes which shall encourage the milking properties of cattle, but I think that both breeders and judges have too much lost sight of this quality in their desire to produce the utmost symmetry of form with early maturity. The following quotation from a speech,

* This diminution is in no way counterbalanced by the imports of foreign stock into the United Kingdom, because while Irish stock since 1859 has been lessened by 677,323, our importations from abroad have only amounted in the same year to 46,127 head, of which one-third were calves sold for veal. The greater part of the Irish stock has come into our graziers' hands, and for the time has tended to keep down the price of lean cattle, but now that the number of reproductive animals in Ireland is so seriously diminished, our supplies both of grazing beasts and of butter must decline.

† The value of the oxen imported has risen in the same time from 14*l.* 10*s.* to [illegible] each.

ıade by Mr. Riley in Cheshire, tends to show the opinion which airy farmers entertain of high-bred stock :—

"As a feeder of beef, he did not mind how nearly the cattle he purchased ere related to 'Royal Dukes' and 'Duchesses,' or even to 'Royal Butterflies;' ıe nearer the better, the first cost being equal; but if he wanted milk and ıeese, he would rather have his stock related to the short-legged, roomy-odied, and rather thick-horned Cheshire cows of 1800, to the Ayrshire, or ven the Welsh cow, and would prefer their being matched to the son of his eighbour's best milking cow than to a bull of Bates's or of Booth's."

We may, indeed, go further, and ask how many of our high-ıred cows can rear their own calves. Beautiful as were the lasses of female shorthorns at Newcastle, there was not one mongst them that we could expect to fill a pail with milk. And 'et if we turn to the early history of their race, we find Mr. Bates lescribing one of his early cows as yielding for some months, on grass alone, butter and milk to the value of 2*l.* 2*s.* per week; ınd of others he speaks as having the same property to a less xtent. Mr. Carr, the enthusiastic historian of the Warlaby and Killerby herds, says of one of the cows, "Satin," that she was 'all a dairyman could desire; but she was never fit to make ıp for show." And of another, "Caroline:" "She was a pro-ligious milker, and her daughter shows what she might have been ɔut for her accident, and her excessive addiction to milk." Phrases like these make us almost fear that the Shorthorn ɔreeder may look upon milking properties as a defect. But ınother ardent admirer of the Booth shorthorns, Mr. Storer, of Helliden, in a letter written and published whilst I was penning :hese remarks, says:—

"If my letter should direct the attention of Shorthorn breeders to the lesirableness of doing their best to retain those milking qualities in their :attle, for which (as well as for the tendency to produce flesh) the breed has long been celebrated, I shall be satisfied."

I cannot therefore but think, that if our great breeders had applied their energy and skill to improving the families in which these good qualities were united, we might have had Shorthorns, not perhaps so perfect in symmetry, but of a more useful character, capable of producing plenty of milk and butter, and likewise of breeding calves—which would, in due time, fill the feeder's stall to his satisfaction.

In the north we expected a good show of shorthorns, and were not disappointed. The whole of the classes were well filled, and in male animals the show was decidedly superior to many that have gone before it. Twenty-five aged bulls were brought into the ring for the first prize. Mr. Wiley, one of the udges, describes them "as a level, good class, of great size and ubstance, though not containing many animals of extraordinary

merit." Mr. Parkinson says: "Every one must admit that the shorthorns were very well represented. With regard to the aged bulls, although they might be called a good class, particularly upon first sight, and probably, taken as a class, equal to former shows, still I think they were very inferior to the cows and heifers. The prize bull, No. 6, although a very fine animal of great substance and quality, with good hair and good looks, wanted the style and length of quarters so requisite for a first-class Shorthorn. We all thought him much superior to any of the rest, but very much inferior to others that have taken the same prize upon other occasions." I think the public had rather a higher opinion of them, and considered this as a remarkably even class of good animals.

There was more difference in the two-year-old bulls, who were not, with one or two exceptions, of the highest stamp.. The yearlings made up a very large class, on which it was not easy to decide, and the ultimate decision gave rise to some criticism. Mr. Parkinson writes of them: "In Class 3 we had great difficulty in making our award. I now think if we made a mistake, it was in not rejecting 51, and placing No. 46 the third." Mr. Wiley merely remarks, it was a fair, good class. I think that in this and the next class, although there were not many animals of the highest style of excellence, some very good useful animals were shown, many of which were sold at satisfactory prices.

The judges and the public generally considered all the female classes good. Of the cows, Mr. Parkinson writes: "The class of cows was very good. I do not think there could be a doubt as to the prize cow being quite deserving her high station. And in giving the other prizes in that class, we showed that the high fed ones did not, of necessity, obtain prizes." This class was generally commended; and, in spite of some extravagance of feeding in all the animals, presented a very fine show of robust Shorthorns. The two judges who communicated with me, speak highly of the heifer classes, in which some of the high-priced animals of the Townley herd had to yield the pride of place; and as a proof of the general excellence of the show, Mr. Parkinson says:—"I have little to add of the heifer classes, except that they promise well to keep up the character of the show in future years. I may also say that I never saw so few inferior animals in a show-yard."

The Shorthorns came from all parts of the united kingdom, and many of the old breeders found it no easy matter to maintain their position against new rivals. The Scotch sent twenty-seven animals, and were most successful, carrying off the first and second prizes in the aged bull class, the first in the two-year old, and the second in the yearling bull classes. In the cows,

the second prize and reserve number; in two-year-old heifers the first prize, in yearlings the second, and in calves the third prizes, besides several commendations, were taken across the border. The districts of Northumberland, Durham, Westmoreland, and Cumberland furnished fifty-one animals to the show-yard, and carried off the first prize for cows, the third for bull calves, and the second for two-year-old heifers.

Before leaving the Shorthorn classes, I will venture to make one or two remarks on the present system of judging, and the criticisms which were addressed to me as steward of cattle. One suggestion made is, that the society should provide men to lead the cattle into the ring, in order to avoid the supposed partiality of judges towards the stock of particular breeders, whose herdsmen are known to them. But apart from the difficulty of finding proper persons in sufficient numbers to lead the cattle, I believe that many, if not most of our judges, know the animals themselves, certainly the older ones, just as well as racing men know the horses that are about to start for a race. For my own part, I would place a complete catalogue of the stock in the judges' hands, and trust to their sense of honour and impartiality, rather than keep our present position of supposed ignorance, which is no safeguard, but rather a screen for favouritism or incompetency. Another suggestion was made that we should increase the number of judges to five, but those who saw the judging of the horses at the Agricultural Hall by a jury of five will not readily forget the tedious process, which produced results quite as much open to criticism as the judging in our own show-yard. I feel sure that three competent men are better than more. Whilst upon this point I would urge all breeders of stock and members of the society generally, to send to the Council a good list of names of men whom they consider qualified to act as judges. The names suggested are so few, and there is so much ridiculous jealousy, that from an experience of three years I can safely say the Council has no more difficult task than the selection of judges. Surely those who neglect to send in names of competent and disinterested men are as much to blame for the difficulties which arise as the Council and those who work hard in its service.

We could not expect a numerically strong entry of either Herefords or Devons, but we had amongst those sent some very superior animals, especially in the female classes of Devons. A Hereford herdsman called my attention to one of the prize cows, which was suckling her own calf, and challenged me to bring a Shorthorn one that would do the same. In the Hereford cow and heifer classes the fault of over feeding prevails, if anything, to a worse degree than amongst the Shorthorns.

Mr. Keary has sent me the following report:—

HEREFORDS.

In the OLD BULL CLASS (IX.) of HEREFORDS, there were several good ones, besides the prize animals. It might be called a small but good class.

In the Second Class (X.), only three were exhibited, two of which were good ones.

The Third Class (XI.) was not a good class.

The next Class (XII.) was a bad class.

The Cow CLASS (XIII.) was small. The first and second prize animals were *very good*, and there were some other good cows.

In Class XIV. (HEIFERS) there were three very good animals, including the first and second prizes.

CLASS XV. (YEARLING HEIFERS).—The prize animals were good.

CLASS XVI. (HEIFER CALVES) contained 3 pretty good ones.

On the whole the exhibition of Herefords was a very creditable one. The number in each class were small, but there were many very good animals, and but few below mediocrity.

DEVONS. CLASS XVII.—Bulls above 3 yrs. and not exceeding 6 yrs. old.

Only two exhibited. The first prize bull (219), belonging to Mr. Walter Farthing, of Stowey Court, Bridgewater, is *a very remarkable animal*, and had certainly the largest amount of flesh upon short legs of any bull in the yard; although he is apparently much too fat and heavy for a bull, we were assured by his owner, after the award was made, that he is a regular and sure stock-getter. This bull was exhibited as a calf at Leeds, where he won, and he has won first and second prizes at every meeting since.

The second prize bull (218) was not in any way remarkable.

DEVONS. CLASS XVIII.—Bulls above 2 and not exceeding 3 yrs. old.

The first prize bull (223), belonging to John A. Smith of Bradford Peverill, Dorchester, of extremely good quality of flesh, and altogether a nice animal; but his head is rather effeminate, and the masculine character not sufficiently developed.

The second prize, No. 222 (General Hood), is in some respects superior to the first prize, but inferior in quality, and not let down enough in his fore-quarters.

Only 3 animals were exhibited in this class, and the third, 224 (Mr. Walter Farthing), was considered worthy of commendation, and is no doubt an improving young bull.

DEVONS. CLASS XIX.—Bulls above 1 and not exceeding 2 yrs. old.

First prize, No. 226 (Walter Farthing), a very useful and improving young bull.

The second, No. 225 (the same owner), below mediocrity. Altogether this must be considered a bad class.

DEVONS. CLASS XX.—Bull Calves above 6 months old.

Only one calf (No. 231) exhibited, and the quality of his flesh was so extremely bad that we hesitated some time before awarding the prize.

DEVONS. CLASS XXI.—Cows above 3 yrs. old.

First prize, No. 234 (John A. Smith of Bradford Peverill, Dorchester), a very beautiful cow, and decidedly the best in her class.

Second prize, No. 237 (Walter Farthing), a very good old cow, having worn remarkably well, and carrying a great deal of good flesh on all her points.

On the whole a very good class.

DEVONS. CLASS XXII.—Heifers in Milk or in Calf.

First prize, No. 244 (Walter Farthing), not a first-class animal.
Second prize, No. 242 (Charles Hambro, of Milton Abbey, Blandford Dorset).
A small poor class, and very inferior to those of former years.

DEVONS. CLASS XXIII.—Yearling Heifers.

First prize, No. 246 (General Hood), a remarkably good heifer; perhaps the best Devon exhibited, and certainly one of the best heifers in the yard.

Second prize, No. 249 (George Turner), rather a nice heifer, but overgrown rumps for her age.
One or two more nice heifers exhibited here, and altogether a nice class.

DEVONS. CLASS XXIV.—Heifer Calves, above 6 months.

One only was exhibited, No. 251 (Walter Farthing); a good calf.

To sum up. The Devons were smaller in numbers, and, excepting a few good animals, the Show must be considered inferior to that at Worcester, and a bad falling off from Battersea. This may be accounted for perhaps by the great distance of Newcastle from the counties where Devons are chiefly bred. None of the true North Devon men, as the Quartleys or Daveys, exhibited.

SUSSEX CATTLE.

These cattle were small in number, and very inferior in quality, &c., to the Battersea Exhibition, where they cut a very good figure. The distance from home may account for the small number shown, but does not explain their great inferiority, as one would have thought that the best would be sent, and the bad ones kept at home.

H. W. KEARY.

Bridgnorth, 26th July.

Mr. Keary's remarks on the Sussex cattle confirm me in my opinion that it is unwise so far from home to offer prizes for any breed of cattle which have no particular merit to recommend them for adoption in other than their own locality. If the other breeds were over-fed, Sussex, at all events, were exhibited in a thoroughly natural state. The Channel Islands cattle mustered strong, when we consider the distance they had to come, and there was an excellent show of the useful red Suffolks, who deserve a better place than a class made up of themselves and the nondescript Breton race.

Although the Scotchmen failed in number in their own especial classes, Mr. McCombie may fairly boast of having shown in the Angus classes some of the best animals in the yard. In other races we in vain look for a cow who, when over thirteen, and having had a calf every year since she was two years old, can still, as his "Charlotte, No. 319," face the ordeal of a show-yard with success. Mr. Fullarton may well describe her and her daughter, as "Two uncommonly fine animals, the young cow being of the most complete symmetry;" while he says of the entries generally, "As a whole we consider the lots shown of this breed to be of great merit, more especially the bulls, cows, and yearling heifers, No 324, Mr. McCombie's yearling being a most

perfect beast." Beautiful as Mr. McCombie's stock are, I should like to have seen some one else enter the lists against him, and show to Englishmen that there is more than one breeder of such excellent stock.

Of Ayrshire and Horned Scotch cattle the show was but indifferent, though the judges, through Mr. Fullarton, report favourably of the Ayrshire cows and heifers, and also of the two West Highland cows belonging to the Duke of Athol.

The local committee offered prizes for Galloways, which were successful in bringing forward some good animals of the breed, the judges calling the aged bulls "a very superior lot," and also quoting the two prize cows "as excellent specimens of the breed." *

I feel how very imperfect are these remarks upon the different classes, but it has been my duty rather to look at the show generally than to make individual criticisms. The cattle were admirably delivered into the yard before the opening of the show, and removed on the Friday night without trouble or confusion. When I left Newcastle on Saturday morning, at 8.30 a.m., the traffic superintendent of the North Eastern railway informed me that all the stock had been sent off during Friday night, except those whose owners wished them to remain. When I remember the confusion of Worcester, I think it only fair to place on record the superior management of the railway authorities at Newcastle.

The cattle were paraded each day in the rings, the beautiful show ground affording ample space for their display, and I believe that both to the owners of cattle and the public this parade gave unqualified satisfaction. It was carried out without any difficulty, because the herdsmen were willing and anxious to assist, and I should not do justice to them if I were not to acknowledge here their ready civility and constant attention to the wishes of myself and the other officers of the society with whom they were brought in contact. I may say the same of the yardmen employed by the society, and of our invaluable assistants, the members of the A division of police. It is very gratifying to me to report that the arrangements for fodder, and generally for the comfort of both animals and men gave general satisfaction. Although there are some trifling improvements in the shedding, which may easily be carried out at a future meeting, on the whole I feel justified in congratulating the society on a show of cattle, somewhat unequal in its component parts perhaps, but still highly instructive and satisfactory.

* In the cases in which I have received any written communications from the Judges, I have quoted their own words, as being preferable to any comments of my own.

Report of the Stewards of Stock at the Newcastle Show.

Horses.

This part of the Show fell 37 short in its numbers as compared with last year, and, in spite of the inducements which were held out to owners of Clydesdales, only 9 entries were sent from over the Border. The whole of the entries reached 164, which were distributed into 33 classes, with three silver medals and 835*l.* of prize money. There was a very clean bill of health, as only 5—to wit, a thoroughbred sire, 2 hunters, and 2 dray-horses—were disqualified, 4 of them for roaring and the fifth for whistling.

The hunters were saddled, and ridden in the very spacious horse-ring—a novelty which gave great satisfaction. We should, however, mention that the mode adopted in the Catalogue, of keeping the Society's and the Local Committee's classes separate, was productive of a good deal of confusion to the spectators and of difficulty to the acting Steward. For the future we beg to recommend that the Thoroughbreds, Hunters, Roadsters, Ponies, and Agricultural Horses should follow each other in that order both in the Catalogue and into the ring for whatever prize they may be entered. It might also be well, after the successful experiment of this year, for the Society to permanently embody in their programme the prize for Agricultural pairs, and to have a class for Three-Year Fillies and Geldings calculated to make carriage-horses. The Pony Classes were very weak. The present standard, "not exceeding 14 hands," just excludes many of the best, but the difficulty might be met by raising it half a hand, and establishing another class for those not exceeding 13.

For the *Thoroughbred Stud-Horse* prize (Class LII.) there were only 10 entries, and "Buccaneer" did not come, in consequence of his owner, Mr. James Cookson, accepting the office of Judge. Cumberland furnished the winner in "Laughingstock," whose owners, the Messrs. Moffatt, were second to "Royal Ravenhill" for the Society's prize with "British Yeoman" at Carlisle, and won it with him the following year at Chelmsford. The winner, of whom one of the Judges says he is "as beautiful a horse as I ever saw, but not fully let down yet," is closely allied in blood to "Asteroid" and "The Marquis." He is by "Stockwell" from a "Touchstone" mare, the dam of "Gamester," and both of these horses were bred by Sir Charles Monck, of Belsay Castle, in Northumberland. But for "Gamester's" lack of knee-action, it would have been a very near point between them; but eventually the St. Leger winner was placed third, as

"Caractacus," the Derby winner, had been, a few weeks before, at the Agricultural Hall. "Cavendish," who was second to "Neville" at Worcester, when the whole class was highly commended, occupied the same position again. "He is a horse of a very beautiful colour, but he seems to be growing coarse." "Sir Walter Scott" was disqualified; and the other five, "Carbineer," "Littlecote," "Layton," "Lord Chesterfield," and "Schuloff," received no mention from the Judges.

The new rule that no horse should compete in the *Hunter Sire*, Class LIII., unless he be thoroughbred, effectually weeded out the motley lot which were entered for this prize at Worcester, while it excluded animals like "Ellcott" and "Safeguard," the very excellent second and third of last year. Only two were entered, and the first prize was awarded to "quite a quality horse," "Motley;" while the second was withheld for lack of merit from "Royal Oak-Day."

Class LIV., for *Hunter Brood-Mares*, was "very ordinary." The winner, Mr. Brown's "Sally," was "rather a nice, short-legged one" from Cumberland, and, like Mr. Charles Moffatt's commended one, by "Galaor." Mr. William Scarth's mare "Plucky" was rising twenty, and still good for her years. As this prize, as well as that for Class LIII., was given by the Local Committee, "Beechwood," the winner of the first prize in the *Hunter Class* (CXXVIII.) at Worcester, was entered again,—an anomaly which might be worthy of consideration by the Council. However, his "action and quality were only ordinary," and the first prize was unanimously awarded to Sir Frederick Graham's chesnut gelding "The Tyke," "a rare galloper and mover altogether, but with less substance than 'Beechwood.'" Mr. Sutton's highly commended "Voyageur" was "light-fleshed and all muscle and wire, with hind-legs of especially beautiful quality," and the Judges also liked "Grapeshot." In fact, "there were several good weight-carrying hunters, but some of them hardly up to a fast thing with foxhounds."

The *Four Year-old Hunter*, Class CXXIX., was headed by Mr. W. H. Clark's "Sprig of Nobility," by "Sprig of Shillelagh," "a rare four year-old, master of great weight, and with depth of rib like an aged horse." The second prize was given to Messrs. Norman's "Radical," "a horse of nice quality, but too short altogether," and with the white hind-stockings which the "British Yeomans" invariably exhibit whenever they fall chesnut. Mr. Pease's "Silas Marner," who was highly commended, "had fair action, but was a little defective in his ribs."

The *Three-Year Old Hunter*, Class CXXX., brought out "a moderate lot." The first prize was given to Mr. Boyd's chesnut gelding [illegible] hinleck;" and the second to Mr. R. W. Hodg-

on's bay filly, by "Neville," and "a good goer." One of the Judges thus reviews the classes in detail:—

"As regards our particular classes, I can only say that as the object was to elect a stallion best suited to improve generally the breed of horses, we were nore likely to succeed in giving the prize to 'Laughingstock,' of 'Bird-atcher' type and blood, than to any other in the class. To get race-horses, should certainly have selected 'Cavendish,' not that I quite approve of him ven for this purpose: but if put to well-ribbed-up mares he may be suc-essful.

"Thoroughbred mares from their frequent want of bone and general power nay be met by a horse *often* without much quality; but the mares sent by armers to a thoroughbred are, nine times out of ten, so lumbering and defi-ient in quality, that much of it is absolutely a *sine quâ non* in a travelling horoughbred sire. Shoulders there must be, as in this point country mares re generally deficient, and as experience tells me that the external organisation s *mostly* from the horse, there is very little chance of breeding a clever horse or the road or field from a bad-shouldered stallion. In racing, shoulders may ometimes be dispensed with, as race-horses travel, so to speak, on even ground; but a hunter has to contend with all sorts of ground, and cannot xtricate himself from difficulties with shoulders into his neck. The prize orse was good in this respect, and with a short back and undeniable trotting ction he beat 'Gamester' who was much more my idea altogether of a horse o get hunters, but he could not either walk or trot. 'Laughingstock,' like iany of the 'Stockwells,' had his hind-legs too much bent, which I think a reat fault in a hunter-sire; but still, take him altogether, he was the best f the lot. Still the lot, with the exception of 'Gamester,' if he had action, as, I am certain, a bad one.

"'Cavendish' was too heavy and coaching in his neck, and wanted another ack-rib to make him *tight* enough to get hunters except out of remarkably iort-backed mares. Besides this, I know every cross of big-headed 'Black-ck' to be utterly deficient in the necessary style and fashion for country urposes. I was therefore obliged to oppose 'Cavendish.' 'Voltaire,' 'Charles II.,' 'Brutandorf,' 'Hetman Platoff,' 'Barnton,' and 'Fandango' have all iore or less had hunting mares put to them, and with few exceptions have gnally failed. If 'Motley' had been shown for the £100 prize, he would ave had a chance in such a year as this was, though he is not quite straight nough on his fore-legs, to beat a good one; still, in other respects, he has ll the character of 'Touchstone,' with compactness enough to meet a country, nd with good knee-action.

"Among the Hunters I thought 'The Tyke' as firm a horse as I ever saw, ith undeniable hind-legs, and almost faultless in other respects; and I had ie satisfaction of hearing (after our judgment was given) from a man upon hom I can rely that he was a first-rate performer in the field, and clever up nd down hill.

"The winner in the Four-year-old class had very light action, and showed iuch blood for a big horse; but he was bigger than I liked, though our judg-ient has been confirmed at Middlesborough, where this class was superior to hat of The Royal.

"The Three-year-old winner was the only one of his class with the slightest retensions to ever making a hunter. The mare that was second, though very lever as far as she went, did not look like getting to size enough for the eld."

The *Roadster Stallion*, Class CXXXI., **was only four strong, nd three** of these from Yorkshire. "**Venison**" **was** "**quite out**

of place" amongst them, and the highly commended "Young Pretender" "had not so much quality as the winner," "President Junior," who has now taken about twenty prizes, nearly all of them firsts. One of the Judges writes thus:—

"The winner is without doubt one of the best looking Roadsters ever seen, and 'Young Pretender' nearly as good; but I beg respectfully to suggest to the Stewards whether it be desirable to encourage this class of stallion. To my mind, this is the animal we want to breed, and not to breed from; as, unless this class of horse is put to a thoroughbred mare (which we know seldom happens), he must beget something inferior to himself."

The *Roadster Mares or Geldings*, Class CXXXII., were "a fair average class, without containing anything very first rate." The winner, Mr. Richard Foster's "Multum in Parvo," an Irish-bred one, "was decidedly the best both in shape and action," and Mr. Pease's neat chesnut, "Whitefoot," was commended. There were only a couple in the *Hackney Brood Mare* Class LV., but neither of them so true a type of the sort as "Crafty," the winner of last year. One of the Judges observes:—

"This prize was for mares in foal or with a foal at their foot; and there were great doubts as to 'The British Queen' being in foal, while 'Fanny' had a foal at her foot. On this account I consider that even if the winner had only been of equal merit with her opponent, instead of being superior in shape, she would have been entitled to the prize. Both mares were good average specimens of Hackneys."

There were only three *Pony Stallions* in Class LVI., and Mr. W. Norman's chesnut, "Jack," the reserved number at Worcester, took the first prize again to Cumberland, which fairly beat Yorkshire in the non-agricultural classes. "'Jack' is of a rare stamp, with capital hock and general action, and shows considerably more breeding than the second prize pony, 'Glengarry,' which is also from Cumberland, but of the old hairy-heeled sort, strong and useful, but deficient in quality." The third was quite unworthy of his company, as he was simply "a rich cream, with bad shoulders and no action." There were no grand Suffolk and Norfolk entries in the *Mare Ponies* (Class LVII.) this year. "The class was very moderate, and as one of the three, No. 409, was disqualified for being 2 inches above the 14 hands specified in the conditions, it only remained for us to decide between the two greys, No. 410 and No. 411, 'Beauty' and 'My Lady,' and our decision was in favour of 'Beauty' as having the best action. Both of them were the property of Mr. George Heppel Ramsay." Class CXXXIII., for Pony Geldings, had five entries, and of these two were not present, and "Flora" was disqualified as being of the wrong sex. "The prize-taker, 'Little Stag,' a roan of 11½ hands, was decidedly superior to his opponent in shape and action, while

'Dick,' a black of 37 inches, is a good specimen of a toy pony. 'Little Stag' went remarkably well." The prize for *Mountain Mare Ponies* under 13½ hands, in Class CXXXIV., was awarded to "a good-shaped, useful, flea-bitten grey, breeder and age unknown, with a good foal at her foot," and nothing to oppose her.

The agricultural horse classes were a mere shadow of their former selves, and contained comparatively few good specimens. Class LVIII., for *Agricultural Sires*, was headed by two well known prize winners, Mr. Samuel Strickland's "Lincolnshire," and Mr. Matthew Read's "England's Glory;" and the former gentleman was also at the head of the Class LIX., with his young sire, "General Garibaldi." In Class LX., for *Agricultural Mares*, Mr. J. B. Dixon's "Jolly," a Northumberland mare, with a very good colt at her foot, was first, despite the weight of eighteen years, and Mr. S. Thompson's "Diamond," a five-year-old mare, and a good prize-winner, second. One *Two-Year-Old Filly* only was entered in Class LXI.

There were only four entries for the 110*l.* devoted to "Drays" in Classes LXII.-LXV. In fact, in two of these classes, there was nothing even to claim the second prize, in a third it was withheld; and that for Two-Year-Old Fillies was a blank for the second time in succession. It seems quite a matter for consideration whether these classes should be continued, as they appear to answer no purpose, and under the present regulations there may be a distinction, but certainly no difference, between Dray and Agricultural Horses. The same animal is often ranked in two successive years under these two different heads.

Class CXXXV., for Agricultural Pairs, produced one of the nicest spectacles of the meeting, as the eight pairs were led round the ring. Mr. C. M. Palmer's very cleanly-looking grey and bay seven-year-olds, "Dick" and "Sharper," took the head prize. A very good pair of bay Clydesdale Mares, belonging to the Duke of Hamilton, were placed next to them, and Mr. A. H. Hunt's bay and black were commended. The head and only prize for a *Clydesdale Stallion*, Class LXX., was awarded to Mr. A. Grierson's "Benicia Boy," who won the 25*l.* last year as the best Clydesdale sire in the Galloway district, and was a capital specimen of this great Scottish breed. "Sir Walter Scott," the first prize winner at Battersea, and quite one of the lions of that show, was disqualified by Professor Varnell for roaring. His son, "Young Sir Walter Scott," a colt of no remarkable promise, won in the younger stallion Class.

None of Mr. Crisp's Suffolk entries arrived, and as they formed five out of the sixteen, which is five less than last year, the show of the "cherry reds" sank into very small dimensions. There were

other absentees as well as Mr. Crisp, and in the *Two-Year-Old Filly* Class (LXIX.), which produced such a wondrous baker's dozen at Battersea, neither of the two entered were forthcoming. In short, the sixteen entries on paper dwindled down to six—four stallions, two in each class, and two brood mares. Mr. E. Collingham's four-year-old stallion, "Talbot," was a compact, good sample of the breed, on sound, short legs. Sir Thomas B. Lennard's "Canterbury Mare" was a very grand mare; and Sir Edward Kerrison, who won this prize last year with "Bragg," now took the second prize with "Lady Jane."

One of the Judges reports as follows:—

"Class LVIII. for aged horses was the most numerously represented, but not better than all the classes ought to have been, with such liberal prizes offered. There was no difficulty in placing them. The first prize went to a fine animal, with much substance and good action; and the second to a short-legged, compact, and very active horse. The accident which happened some time ago to the latter's off fore-foot did not make any difference in his style. No. 418, 'Blooming Heather,' was neat and well proportioned, but not very large.

"Class CCLIX., for two year-olds, needs but little comment, as it had only four entries. We hope they will improve as they grow older.

"Class LX. contained some very good mares. The first prize was awarded to a particularly fine mare, 18 years of age, but not looking nearly so old. We cannot help thinking that her stock have done show-yards some service. The second prize mare ran her hard, being a very clean-legged, good shaped, and strong animal, but not showing out to advantage. A very fine mare was shown without a foal. This being a class for mares and foals, she could not take a prize, though well deserving of it, and we hope to see her and her progeny at some future day.

"Classes LXII.-LXV., for drays, contained only four entries, and leave more room for regret at the little support the dray classes received than for comment on the merits of the animals, but I would not omit to mention the beautiful foal with the grey mare, No. 437.

"Class CXXXV., for pairs of mares or geldings. Amongst this local class, were many very good animals, which commanded much of the public attention, and, if such were bred in the neighbourhood, the classes for both sires and dams ought to have been better filled, more especially as we noticed the good style of horse generally used about Newcastle. Had there been three prizes instead of one, they would have fallen to highly deserving animals. The owner of the two mares, No. 527, 'Sally' and 'Maggie,' may well feel proud of them.

"Classes CXXXVI. and CXXXVII., for three year-old agricultural geldings or fillies and two year-old geldings. Only four out of the six entries put in an appearance, and these call for no particular notice; but the yearlings in Class LXXXVIII. had amongst them some very promising aspirants to fame. The first prize-taker was a very superior colt; the second, somewhat hunter fashion, but with plenty of strength, and no doubt will thicken into a first-class plough-horse. Of those not in the prize-list, No. 543, a Suffolk, deserves mention, and will most likely be heard of another day."

Another of the Judges writes:—

"Taking them altogether I never saw the agricultural horses so moderate, in short, not a first-class animal among them, though there were several good ones. In Class LVIII., for stallions, the first prize horse was a good one, clean and active; the second satisfactory; and the third ditto. This was the best class

at came under my notice. I really do not think the other classes worth marking upon, except the local class for mares and geldings, which, taking em altogether, I considered good. I cannot understand why the numbers ere so short in most classes, as the arrangements were first-rate, and every cility was afforded for selecting the best without any trouble. So much ace is a very great advantage to the Judges."

It was very evident that the exhibition of horses, taken altoether, was not so good as it ought to have been, and not nearly qual to many of the local shows in Yorkshire and Lincolnshire -not to mention the Agricultural Hall, where 40 thoroughbred allions, many of them very superior, 60 hunters, 20 hacks, and great number of ponies were shown. With few exceptions iis has always been the weak point in our meeting, and there iust be some cause; perhaps we may profit by experience, and iake improvements before the next show at Plymouth. No oubt if we wish for a good exhibition we should afford every icility to exhibitors and impose as few restrictions as possible.

The charge of 2*l.* for each horse-box is very objectionable, nd has a material effect in diminishing the numbers. It is no nswer to say that the horses would cost more in the town, or aat formerly we did not provide boxes. It is not to be expected hat any one will send a horse from a warm stable to be placed n an open shed with a thorough draught.

Two Hunter sires!—perhaps now we shall not insist on their eing thoroughbred—of course they should have several crosses f good blood, but it cannot be right to exclude such horses as "Elcott," "Safeguard," "East Lancashire," "Grey Prince," or host of others.

The rule that mares should either be in foal or with a foal revents many of the best from being shown. This condition hould be erased from the prize-sheet.

R. MILWARD.

SHEEP.

In its entries of Cotswolds, Oxford Downs, Southdowns, and hropshires, the Newcastle Meeting was considerably below Vorcester. Even Leicesters and Lincolns showed a slight ecline, and so would the "Hampshire and other Short Wool" lasses, if they had not been helped out by a few Holme Lacey Lyelands. Still if the distance from their peculiar localities told everely upon the display of four of the leading breeds, their eficiency (102) was more than compensated for by the entries of heep peculiar to Scotland and the Border counties, and thus the alance against Newcastle was reduced to 32 on a total of 415.

The new requirement that all sheep exhibited should have een *really and fairly shorn bare* now first came into operation,

and its good effect was most strikingly manifest in the absence, with three exceptions, of the preposterous length of wool left upon so many animals in previous years. Still there were a few other cases open to a suspicion that the above condition had not been *literally* fulfilled, and if it be so, and any exhibitors are now congratulating themselves upon having escaped detection, they will do wisely to abstain from repeating the deception, which amounts, in fact, to a fraudulent entry, and must be so treated. Two Inspectors of Shearing were appointed by the Council, one of whom was unavoidably absent, and thus the invidious duty devolved upon Mr. Samuel Druce of Eyntham alone, who kindly, though reluctantly, undertook the task; and reports that "the requirement of the Council that all sheep shown should be bare shorn after the 1st of April has been carried out except in the case of three rams of the Mountain Cheviot Class." These animals were disqualified accordingly.

The entry of *Leicesters* (which "comprehended many grades" in Classes LXXIV.-LXXVI.), fell three short of what it was when the Society met at Newcastle eighteen years ago; but it is pleasant to note that of the four gentlemen, Messrs. Turner, R. Smith, Burgess, and Pawlett, who then took prizes for their rams in the face of a very severe competition, the only two that are alive or continue to breed "Bakewells," were in the front rank again this July. The name of Mr. Sanday, which has for many years been as closely connected with this class as that of the late Mr. Jonas Webb with the Southdowns, was absent from the catalogue at last; but the grandsire of Mr. Borton's first Prize shearling was one of his old Holmpierrepont flock. This was "a very nice sheep with a very beautiful skin," and twin to Mr. Borton's reserve number. Mr. Pawlett was second, and Colonel Inge, who was first in this class last year, took the silver medal. The rams were "a very good class," and Mr. Cresswell was first (with his reserve number at Worcester), and second, and commended as well, while the medal and the reserve number fell to Mr. George Turner. There were only five pens of shearling ewes, and Mr. Samuel Wiley, of Brandsby, the patriarch of Leicester ram-breeders since Sir Tatton Sykes died, "won for a sharp contest," with Lieut.-Colonel Inge, who took the first prize last year. Mr. Wiley's were "a very good lot with fine skins," and quite a Brandsby model pen.

The Cotswold, Classes LXXVII.-LXXIX., were not, as a whole, so uniform or so well got up as we have known them, and hardly so heavy in wool. Mr. Robert Garne, who took two firsts, a second, and a third last year, did not make an entry; and Mr. William Garne and Mr. George Fletcher (who was first with his shearling ewes at Worcester) were also resting on their

oars. The shearling ram entries alone on that occasion were exactly equal to the present entries in all three classes. Mr. E. Handy, who won the first ram and the second shearling prizes here in the general long wool class, in 1846, was first now with his shearling; and Mr. Beale Brown, who had the second shearling prize of last year, took first and third honours in the ram class, with two very fine sheep. The lots fell pretty equally, as Mr. J. Wells was first in his turn for the shearling ewes, and Mr. W. Lane second.

The Cotswold Judges Report thus:—

"The shearling rams were not so numerous nor were they so good as on former occasions. There were four fine specimens of older sheep, very large, of fine form, and well woolled; and the shearling ewes were of average merit. Doubtless, the distance prevented many from sending sheep. Among other names which we missed in the catalogue of exhibitors, and which we hope to see in the classes next year, were those of Messrs. Hewer, Fletcher, Garne, &c."

In the *Lincoln and other Long Wool*, Classes LXXX.-LXXXII., Mr. R. Wright (who did not exhibit last year) and Mr. T. B. Marshall were first and second respectively for shearling rams and ewes, and a pen of shearling ewes belonging to the latter gentleman again divided two of Mr. Howard's. The first prize shearling was a good one, with fine substance, and a long and thick set staple of wool. The first prize ram was a very grand sheep, girthing 6 feet, and said to have cut 19½ lbs. of wool. The second was also a very good one, with wool perhaps finer in quality, but not so thickly planted. The first pen of shearling ewes had plenty of size and nice bone, and the second and third were also gay and good.

The *Oxford Downs* (Classes LXXXIII.-LXXXV.), as is to be expected in a cross-breed of this kind, still exhibit a considerable diversity of colour in their legs and faces; but the tendency seems as much as possible towards the dark faces, and to the retention of the Cotswold top-knot. Some of them were perhaps a little too high on the leg, but it was a very fair show on the whole. Mr. George Wallis, who won all the ram prizes last year, was in equal force again, and also "skinned the lamb" in the shearling ram class. Of shearling ewes there were only four pens; the first and second prizes were awarded to Mr. Henry Overman and the Duke of Marlborough; the two other pens were highly commended, and commended. Subjoined are the Reports of the three Judges:—

"I considered the *Oxfordshire Downs* a good class, although not so numerous as last year. The shearling rams shown by Mr. G. Wallis, which obtained the first, second, and third prizes, were exceedingly good, big with fine quality,

and so were the sheep shown by that gentleman in the Class for Rams of any age."

"Numerically speaking, neither the Oxford nor Hampshire Downs appeared in much force, which may be accounted for by the great distance of the show from the localities in which these different kinds of sheep are bred. The several classes of each kind of sheep contained specimens which fully sustained the high position they have respectively attained. The *Oxfordshire Down* shearling ram class came first under notice. The 1st, 2nd, and 3rd prize sheep of Mr. Wallis were of good formation, combining fine size with good wool. The 3rd prize sheep was a very compact, well-formed animal, and which, if its head had been more in character with the true Oxfordshire Down ram, would have been differently placed. The sheep exhibited by Mr. Bryan were strong firm-fleshed animals. Those exhibited by Mr. Charles Howard were not up to the mark for competition in a Royal Show-yard. In the class for aged rams, the prizes again fell to the lot of Mr. Wallis for sheep of much the same stamp as those exhibited by him in the shearling class. The other sheep exhibited in this class were good specimens of their kind. The class for shearling ewes did not contain a pen of any extraordinary merit. The ewes exhibited by Mr. Overman were more uniform in form and in quality of wool than those exhibited by his Grace the Duke of Marlborough, though the latter had most decidedly the preference for colour."

We have seen a better class of shearling *Southdown* rams at previous meetings of the Society. The tails of some of them were not nicely set on, and two or three might fairly challenge the old Sussex comment "he won't do—he ties his stockings above his knee." Last year, Lord Walsingham won every prize in the ram and shearling class, and had the reserve numbers as well; but on this occasion his Lordship showed no older rams, but repeated his victories with the first and second prize shearlings, and the first prize for shearling ewes. His Lordship's first prize shearling was a very perfect sheep of his kind, but rather small. The second, which had been first at the Norfolk Show, was a larger sheep, but decidedly inferior in symmetry, as he is too high in his rumps. Mr. Rigden's medallist was very nice behind, but fails in his shoulders. Mr. Waters, who had never previously won a prize for this breed of sheep in the Society's Yard, was first in a very fair class of rams, with a very good one. It had plenty of size, and fine loins, and was full of the real Down character. A more perfect forehand has been seldom seen. The second prize was taken by a ram of Mr. Rigden's, not noticed in the shearling class at Worcester, with fine rumps, wool, and general quality. The ears of the silver medal sheep were rather too short; but he was very good and straight in the back, and very snug in front. A noted old Babraham sheep was not noticed in this class, and seemed to have lost his handle on the journey.

The shearling ewes made up a very beautiful class, and it would be difficult to find a match for the first prize pen, sent by Lord Walsingham. The Goodwood ewes were a very level lot, but not on quite so large a scale, and hardly so well got up. The four other pens, those of the Duke of Richmond, the Earl of Radnor, Lord Walsingham, and Sir Thomas Lennard, were all highly commended, and most deservedly so.

The judges of the *Shropshire* sheep, Classes LXXXIX.-XCI., who remark that "some of the breeders of pens will in future do well to pay greater regard to the appearance, the character, and the wool of their sheep," and mention ten entries sent by five different owners, have handed in the following report:—

"The *Shropshires* form, we believe, the largest of any of the Sheep classes at the Royal Meeting of the present year, the numbers entered being as follows, viz.:—

"Class	LXXXIX.—Shearling Rams	46
"	XC.—Older Rams	9
"	XCI.—Shearling Ewes	10

"This number of entries we consider comparatively large, taking into consideration the distance at which the Show is held from the counties whence they sprung, and the districts where they have hitherto been best known and appreciated.

"We have great pleasure in recording our opinion that the *Shropshires* exhibited at Newcastle are, with a few exceptions, uniform in character and quality, and combine good size and weight with excellent wool-growing properties; and that they are in all respects well calculated to maintain their position as a useful and profitable breed, and to obtain the favour of those persons who study to breed an animal capable of producing at once a high-class and plentiful supply of mutton and a heavy fleece of good wool.

"We find the class much more distinctive and uniform in character than in former years, the result, no doubt, of the sheep being recognised by the Royal Agricultural Society of England, and the consequent stimulus to flockmasters to breed from pure sires, possessing natural perfections and blood of unquestionable purity.

"In making our selections, we have endeavoured to adhere to the type we consider best calculated to maintain the reputation of the breed, and to promote the advantages of sheep breeders and the public generally; and while we have kept in view the importance of producing a heavy fleece, we have not forgotten the necessity of recommending the animals most capable of producing *heavy muscular flesh*, and those best calculated in their own natures to perpetuate a symmetrical, heavy, and hardy sheep.

"We are pleased to note that the general excellence of the Class of Shearling Rams caused us much trouble in making our decisions, no fewer than 18 specimens being ordered by us into the ring to make our final selections from, and we do not hesitate in pronouncing them to be the best 18 sheep we ever saw together."

The first prize for Shropshire shearlings was awarded to a totally new exhibitor, Mr. E. Thornton, of Pitchford, with Mr. H. Matthews and Mr. J. Coxon second and third; and the strength of this class may be judged of from the fact that the

judges gave six high commendations, and five commendati[illegible] In the ram class of any age, Mr. John Coxon and Mr. P[illegible] William Bowen took the first and second prizes. In that [illegible] shearling ewes, the Messrs. Crane (who have won five out of [illegible] prizes during the last three years) were not in their usual fo[illegible] and Mr. H. Matthews, Mr. H. Smith, and Mr. E. Holland, M[illegible] were the prize takers. It is worthy of remark that two Yo[illegible] shire breeders had high commendations in this and the ra[illegible] class.

Of the *Hampshire and other Short Wool*, (Classes XCII. a[illegible] XCIV.) the Judges report separately :—

"Although they were not so well represented in numbers, they were nev[illegible] surpassed in quality. The shearling ewes shown by Mr. W. B. Canning had th[illegible] size of the *Hampshire Down* and the quality of the *Sussex*, and his first priz[illegible] shearling ram was quite as good as his ewes. Mr. Humfrey's shearling ewe[illegible] were exceedingly good, and his first prize sheep in the class for rams of an[illegible] age was never surpassed for size and quality."

"The *Hampshire Downs* appeared in still fewer numbers than the Oxfor[illegible] Downs, though the different classes contained specimens of greatly improve[illegible] form and quality. The first-prize shearling ram, exhibited by Mr. Cannin[illegible] is one of good form with beautiful quality of flesh and wool. The first-pri[illegible] aged ram, exhibited by Mr. Humfrey, is equally remarkable for fine form (pa[illegible] ticularly about the setting on of the shoulders) and has also good quality [illegible] flesh and wool. The shearling ewe class contained three pens of extraord[illegible] nary merit. I should think the pen exhibited by Mr. Canning has nev[illegible] before been equalled (certainly not surpassed) for colour, form, and quality [illegible] flesh and wool combined. The pen exhibited by Mr. Humfrey was very goo[illegible] indeed, as also the pen exhibited by Mr. King."

"The show of Hampshire Downs was very meagre as to quantity, but th[illegible] quality was very good. Mr. Rawlence, who was so successful at Worcest[illegible] last year (although he had entered both shearling rams and ewes), did not p[illegible] in an appearance, which left the field open for Mr. W. Canning of Elsto[illegible] who exhibited perfect specimens of rams and ewes, which took first prize[illegible] Mr. Humfrey's stock did not come up to their former excellence, and M[illegible] King of Beckhampton took the second prize for shearlings with a very lar[illegible] old-fashioned Hampshire—not 'the Improved.' Mr. Humfrey's aged ram wa[illegible] a very fine specimen of what a Hampshire ought to be, and took second pri[illegible] at Worcester last year. There were only three pens of ewes exhibited, bu[illegible] they were all good; Mr. Canning's were A 1, Mr. Humfrey second, and M[illegible] King's specially commended. The distance from home prevented many [illegible] the Hampshire flockmasters from sending their stock, but it must not [illegible] considered, from the shortness of the entries, that the interest in the breed [illegible] [illegible], as the prices lately realised at the sales prove the contrary."

[illegible] competition in these classes was confined to six breeder[illegible] [illegible] one of them (Mr. J. B. Downing) entered four of his Holm [illegible]acey flock of Rycelands, which were so successful in the[illegible] [illegible] [illegible] [illegible]ast year [illegible] they received no mention.

The Cheviots were by no means so good as we have seen them at the Highland Society's meetings, and there were no entries from Messrs. Brydon, Borthwick, and Hunter, who carried off a great majority of the prizes at Battersea. There was not a single Scottish entry in the Blackfaced classes, which were furnished by Yorkshire, Durham, Northumberland, Westmoreland, and Cumberland. The Herdwicks were pretty nearly a Cumberland class, as that county sent thirteen entries out of sixteen, but still Westmoreland and the Messrs. Browne had the best of it in the prize list.

"The kingdom of Scotland and Northumberland," as the breeders of Border Leicesters term it, did its duty very fairly. This class of sheep has been coming into repute for some years past with the English flockmasters, many of whom attend the great Kelso ram sale in September. Last year no less than 2180 rams were sold there in one day. The Border type is so marked that the Judges at once disqualified two English Leicesters which were entered in the ram class. The black spots which are discernible about the head and ears of so many of them tell of their descent from the old Teeswaters. They are small in the scrag, but have fine general substance and size, and cross well with the Lincolns and Cotswolds. They also do well on moderate land, and bear storms well at the foot of the Cheviots. It is the speciality of the ewes to be very prolific, and to "milk like goats." They are rather bare on their bellies, and have fine but rather light weighing wool. Their breeders go for open wool as much as possible, so as to correct the close coat of the Cheviots in crossing; and if there is one thing they avoid more than another it is a tendency to blueness about the head. In the prize list the Messrs. Simson were especially successful.

The Judges report as follows on these four breeds —

"In the Class of *Cheviot* Shearling Rams there is a good entry, and the breed is well represented. The shearling ewes are also a fair lot; but the aged rams are limited in numbers, and, with one or two exceptions, only of ordinary quality.

"The *Blackfaced* breed is poorly represented in all the classes.

"The *Herdwicks* are a good lot in all the classes.

"In the *Border Leicester* classes there is a good show of shearling rams, several of which are of superior quality. In the other classes the entries are fair, but in each the breed is well represented."

The two Wool Judges have handed in the subjoined Report:—

"In presenting their Report the Judges wish to observe that, considering the reputation of Northumberland as a wool-producing country, and its contiguity to Berwickshire, which produces the most valuable, deep-stapled

wools in Great Britain, the show of wool did not equal their expectations, either as to quantity or quality.

"The class of Leicester and Border Leicester was moderate, and specimens were found which they considered were not pure Leicester, but descended from the Cheviot ewe. They would recommend the Council to have a special class for wools of mixed breeds. The single specimens of Cotswolds and Lincolns being of no merit either for breed or texture, the prizes were withheld. The Shropshire specimens were very good, and that which obtained the prize was first-rate wool, both as regards breed and quality of staple, combined with strength and cleanliness. The other descriptions being only moderately represented need no comment."

Pigs.

In spite of the proximity of Newcastle to the great pig breeding districts of the West Riding, the entries under this head showed a decrease of twenty as compared with Worcester. The local committee gave no prizes, but the deficiency was mainly to be found in the small white and Berkshire classes, which far more than counterbalanced an increase of one-third in the large whites.

Class CI., for *Large White Boars,* was better than last year, and there were more of them. The first prize, Mr. H. Harrison's "Young Hero," from a sow of Mr. Wainman's breed, wanted a little more hair, but was an easy winner. He is a very good and level pig, with great width between the ears and over the shoulders, and remarkably well filled up about the head. Mr. Duckering's "Victor," the second prize taker, had no tail to speak of; which is too often the first symptom of in and in breeding.

The *Small White Boars* made up a very good class (CII.), but smaller than last year, when Mr. Mangles had six entries, and was third with "Cupid." This gentleman now wins with Cupid's own brother, "Brutus," which was then the reserve number, and has grown into a very excellent pig, both in flesh, form, and hair. Mr. Findlay, of Easterhill, was second with "George I.," a good thick-fleshed pig, and Mr. Stearn third with "Young Duke," which was very much younger than either.

Among the *Small Black Boars* (Class CIII.) there was rather a tendency to be short of hair, a want which the profusion of black essence with which they are covered can hardly be said to supply. The hair of both Mr. Sexton's "General Peel" and his "Blair Athol," the first and second prize winners, both of them by "Battersea Prince," was perhaps a little too coarse. The former had a fine outline, but the latter fails slightly behind the shoulder. Mr. Stearn's "Sambo" was softer in the hair, but there was too little of it.

The *Berkshire Boars* (Class CIV.) were very inferior in every way to those shown at Worcester, and Messrs. Hewer and Joyce, who contributed ten out of twenty-three entries on that occasion, were conspicuous by their absence. The Rev. H. G. Baily won both the first and second prizes, as Mr. Hewer did last year. The first was a fair, useful pig, and the second had not a particularly nice head, and was rather slack behind the shoulders, and narrow between the ears. Mr. A. Stewart's "Garibaldi" was only seven months old, but his quality and symmetry were remarkably good, and he well deserved the silver medal.

Class CV., for *Middle Boars*, was as short in numbers as it was last year, when Mr. Wainman won with "The Nabob." This gentleman (who took five first and two second prizes) won again with "Perfect Cure," by "King Cube," the Worcester first prize winner in the small white boar class. "Perfect Cure" has a rare back, good hair, and hams fully suggestive of his name. Mr. C. W. Graham's "Pride of Leeds" again holds the second place; but he does not fill all his points so well as the winner, and is hardly so straight in his back or so wide below.

The *Large White Sows* made up a good level class (CVI.) of thirteen, or six more than last year, when it was won by Mr. Wainman's "Fresh Hope," whose hams when she was killed in the spring weighed 94lbs. each. Mr. Wainman was first and second with two very deep sided and short legged sows, "Rival Duchess," and "Rival Hope." The former, which won at Hamburg last year, was the youngest by six months, and was in better bloom; while the latter, as well as the medallist, Mr. J. Hickman's "Young Princess," had a litter of pigs at her teat.

The *Small White Sows* were a capital class (CVII.), though Mr. Crisp, who was first in this as well as three other classes at Worcester, did not send any of his entries. Mr. Wainman's "Silver Branch," a wide, deep sow, of great activity, and with capital hair, took the first prize, but her appearance rather suffered from her being so heavy in pig. The second prize taking sow, Mr. Stearn's "Victoria II.," which was also second at Worcester through the disqualification of Sir Edward Kerrison's "Annie Laurie," had a rare lot of pigs at her side. Mr. Findlay's third prize sow, "Lady Emily," by his "George I.," was very symmetrical in her back, but perhaps rather wanted depth; and Mr. Hatton also exhibited two good ones, "Queen of the West" and "Reine de Flora."

A good Class (CVIII.), of *Small Black Sows* was headed by Mr. Sexton's "Breeze," own sister to his "General Peel," a sow of very true proportions, well backed up by Mr. Stearn's "Queen

of Oude," and "Aunt Chloe," the latter of which was perhaps a little light in the poll.

Class CIX., for *Berkshire Sows*, contained several specimens rather too high in the back, and deficient in the filling up of the jowl. There was only one entry (which received a high commendation) instead of five, as at Worcester, from the Royal Agricultural College; and Mr. Joyce's absence from the ranks was hardly compensated for by Mr. Wainman, who showed Berkshires for the first time. "Dido" and "Mrs. Gamp," two very clever sows, the property of Mr. Arthur Stewart, were first and second, and Mr. G. M. Allender's "Topsy," which took the third prize by lapse at Worcester, now held that place on her own account. The winners were decidedly "Improved Berkshires," but still the class fell short of the very excellent one of last year.

There were again exactly eleven entries in Class CX. for *Sows of the Middle Breed*. Mr. Wainman was first and second, with "Northern Garland" and "Happy Link," which were somewhat difficult to divide. Both of them were rather short of hair, but especially beautiful in their bone. "Happy Link" was second last year, but was disqualified in consequence of having her first litter of pigs nineteen days too soon, and her next eleven days too late; and hence "Lucky Link," another of Mr. Wainman's, succeeded to her prize. Mr. H. Reynolds's "Dewdrop," by "Pride of Leeds," the reserve number of last year, took the silver medal.

We now come to the pens of young breeding sows. Mr. Wainman was first in the *Large Whites*, Class CXI., with a middling lot, very unlike his "Advance Symmetry," "Advance Quality," and "No Surrender," of last year.

For the *Small Whites*, Class CXII., there were only two entries. Lord Wenlock's had quite as good, if not better quality than Colonel Pennant's first prize pen, but their hams were lighter, and they did not stand so well on their legs. Mr. Sexton's "Three Graces," from his Battersea first prize sow, won easily in Class CXIII. for *Small Blacks*. Mr. Tombs and Mr. Druce were first and second in Class CXIV. for *Berkshires*, with pretty fair pens, which can hardly be said for Class CXV., [illegible] its sows of the *Middle Breed*. On the whole, it was a fair average show of pigs, but not up to the level of Leeds, Battersea, or Worcester.

XXV.—*Report of Experiments on the Growth of Wheat for* 20 *Years in succession on the same Land.* By J. B. Lawes, F.R.S., F.C.S., and J. H. Gilbert, Ph. D., F.R.S., F.C.S.

[Continued from Page 145.]

II. Effects of the unexhausted residue from previous manuring upon succeeding crops.

When the same crop has been grown for many years in succession on the same land, in some cases with a change of manures, and in others with the same manure year after year, it is obviously essential to a right interpretation of the results obtained, carefully to consider the effects of the unexhausted residue from previous manuring upon the succeeding crops. The questions of the permanency of effect of different manures, and of the tendency to exhaustion which partial manuring may induce, are, moreover, of great practical importance, and are frequently discussed by practical men.

These questions cannot, however, be satisfactorily dealt with without such evidence as the accurate record of the amounts of produce obtained year after year, on the application of manures of known description and amount, can alone afford. The results of the experiments which form the subject of this Report obviously provide data well fitted to aid the elucidation of some of the important points involved. The subject is necessarily one of detail, requiring analytical as well as field results for its full consideration; but it will be here treated of by reference to the field results alone, and only so far as may be necessary to aid the proper interpretation of the results themselves, and to give some indication of their bearings upon the important practical questions—on the one hand of accumulation, and on the other of exhaustion.

The results first adduced will illustrate more particularly the effects upon succeeding crops of an accumulated residue from previous nitrogenous manuring.

In the first year of the 20 of the experiments, plot 4 was manured with the ashes of farmyard-dung, and gave no increase of produce whatever; during the next 7 years it was manured with superphosphate of lime and sulphate of ammonia, the latter in amount averaging about 277 lbs. per acre per annum; and throughout the subsequent 12 years it received no manure whatever. Table XXIII. shows the produce and increase obtained during the 7 years of the application of the artificial manures, and also during the succeeding 12 years under the influence of the previous heavy cropping, and of the unexhausted residue of the previous mineral and ammoniacal manuring:—

TABLE XXIII.—PRODUCE and INCREASE of WHEAT obtained during 7 Ye
of the application of Phosphatic and Ammoniacal Manure, and during
12 succeeding Years without Manure.

Plots.	MANURES, &c.	7 Years, Manured. 1845—1851. Total.	7 Years, Manured. 1845—1851. Average Annual.	12 Years, Unmanu 1852—1863. Total.	12 Years, Unmanu 1852—1863. Aver Annu
	Dressed Corn, per Acre; in Bushels and Pecks.				
4	Superphosphate of Lime, & Sulphate of Ammonia, annually, for 7 years	193 0	27 2¼	203 1¾	16
3	Continuously unmanured	123 2¾	17 2¾	185 3½	15
	Increase	**69 1¼**	**9 3½**	**17 2¼**	**1**
	Weight per Bushel of dressed Corn, lbs.				
4	Superphosphate of Lime, & Sulphate of Ammonia, annually, for 7 years	..	61·2	..	57
3	Continuously unmanured	..	60·2	..	56
	Difference	..	1·0	..	0
	Total Corn, per Acre; lbs.				
4	Superphosphate of Lime, & Sulphate of Ammonia, annually, for 7 years	12,786	1827	12,858	1
3	Continuously unmanured	8,037	1148	11,567	
	Increase	4,749	679	1,291	
	Total Straw (and Chaff), per Acre; lbs.				
4	Superphosphate of Lime, & Sulphate of Ammonia, annually, for 7 years	20,620	2946	20,783	
3	Continuously unmanured	12,799	1828	19,940	
	Increase	7,821	1118	843	
	Total Produce (Corn and Straw), per Acre; lbs.				
	Superphosphate of Lime, & Sulphate of Ammonia, annually, for 7 years	33,406	4773	33,641	
3	Continuously unmanured	20,836	2976	31,507	
	Increase	**12,570**	**1797**	**2,134**	

... s of farmyard-dung had been used without gi
... he phosphatic and ammoniacal manuring g

during the 7 years of its application, a total increase of about 69½ bushels of dressed corn, and 7821 lbs. of straw; or an average annual increase of nearly 10 bushels of dressed corn, and 1118 lbs., or about half a ton of straw. These amounts would remove from the land only about one-third of the nitrogen, and one-seventh of the phosphoric acid supplied in the manure; to say nothing of the phosphoric acid, and all other mineral constituents, supplied in the first year of the experiments (1843-4) in the form of the ashes of farmyard-dung. Yet the total amount of increase obtained during the next 12 years, due to the large residue from the previous manuring, was only 17½ bushels of corn, and 843 lbs. of straw, or of corn about one-fourth and of straw about one-ninth as much as that yielded during the seven years of the application of the phosphate and ammonia. The average annual increase over the 12 years amounted to less than 1½ bushel of dressed corn and to 70 lbs. of straw.

This experiment was arranged for the purpose of determining whether during the later years there would be a less produce than on the continuously unmanured plot, indicating exhaustion of the available alkalies and silica during the 7 years of forcing by the application of other constituents to their exclusion; or whether there would be an increase, due to the accumulation in the soil of nitrogen and phosphoric acid, in which case it might be concluded that there was, as yet, no deficiency of available alkalies and silica in the soil, relatively to the annually available supplies of nitrogen from natural sources. The latter proved to be the case. In fact, there is no doubt that the farmyard manure ashes applied in the first year, would supply at any rate considerably more potass than was removed by the increased produce during the next 7 years. It will perhaps be objected, that the increase would have been much greater, both during and after the 7 years, had fresh supplies of alkalies been provided. Under the conditions of the experiment, such as they were, however, the unexhausted residue of previous manuring was obviously very slowly available in succeeding seasons.

Again, to a portion of the experimental plot 3, from which 12 unmanured crops of wheat had been taken—a kind of treatment which it has been alleged by Baron Liebig would bring our soil into such a condition of exhaustion of available mineral constituents that it would yield no increase on the application of ammonia-salts alone—a dressing of these salts was applied in the 13th season, and then 7 crops were taken without further manure, in order to trace the degree or limit of the effect of the unexhausted residue of nitrogen supplied. The results are given in the following Table (XXIV.):—

TABLE XXIV.—PRODUCE and INCREASE of WHEAT, both in the Year of Application, and during the 7 succeeding Years, by the use of Ammonia-salts alone for 1 Year after 12 Crops without Manure.

Plots.	MANURES, &c.	1 Year, Manured (after 12 Unmanured). 1856.	Total, 7 Years Unmanured. 1857—1863.
	Dressed Corn, per Acre; in Bushels and Pecks.		
3a	400 lbs. Ammonia-salts for 1856, afterwards unmanured	28 0¾	115 0¾
3	Continuously unmanured	14 2	113 2¾
	Increase by Ammonia-salts	13 2¾	1 2
	Weight per Bushel of Dressed Corn; lbs.		
3a	400 lbs. Ammonia-salts for 1856, afterwards unmanured	56·3	..
3	Continuously unmanured	54·3	..
	Increase by Ammonia-salts	2·0	..
	Total Corn, per Acre; lbs.		
3a	400 lbs. Ammonia-salts for 1856, afterwards unmanured	1759	7138
3	Continuously unmanured	892	7025
	Increase by Ammonia-salts	867	113
	Total Straw (and Chaff), per Acre; lbs.		
3a	400 lbs. Ammonia-salts for 1856, afterwards unmanured	3052	11,836
3	Continuously unmanured	1558	11,448
	Increase by Ammonia-salts	1494	388
	Total Produce (Corn and Straw), per Acre; lbs.		
3a	400 lbs. Ammonia-salts for 1856, afterwards unmanured	4811	18,974
	Continuously unmanured	2450	18,473
	Increase by Ammonia-salts	2361	501

Thus, 400 lbs. of ammonia-salts per acre, applied on land which had grown turnips, barley, peas, wheat, and oats since manuring, [illegible] her 12 crops of wheat without manure, and applied, more-

over, in a season of inferior grain-producing quality, gave in the year of the application an increase of about 13¾ bushels of dressed corn, and 1494 lbs. or rather more than 13¼ cwts. of straw. This amount of increase would, however, carry off only about one-fourth of the nitrogen supplied. Yet the total increase obtained without further manure during the 7 succeeding years, was only 1½ bushel of dressed corn, and 388 lbs., or about 3½ cwts., of straw. Here again, then, the residue of the previous nitrogenous manuring was but very slowly, and very partially, recovered in the succeeding crops.

It may, of course, be alleged against this experiment, that the want of effect of the residue of the previous nitrogenous manuring was due to the exhaustion of mineral constituents. The experiment next considered is less open to this objection.

Plot 5 was variously, but liberally, manured during the first 8 years of the experiments. During that period, considerably more nitrogen, more than twice as much potass and phosphoric acid, and probably more of every other mineral constituent, except silica, had been applied in the manures than was taken off in the total produce; and very much more, therefore, than was contained in the increase of produce. In each of the 12 succeeding years, a mixed mineral manure, supplying liberally potass, soda, magnesia, lime, sulphuric acid, and phosphoric acid (but no silica), was applied. Table XXV. (over leaf) shows the results obtained during these 12 years.

It is seen that the total increase obtained during 12 years by the annual use of a liberal mixed mineral manure, succeeding 8 years of accumulation of nitrogen and mineral constituents, was only about 35⅓ bushels of dressed corn, and 2827 lbs., or about 25¼ cwts. of straw; equal to an average annual increase of less than 3 bushels of dressed corn, and little more than 2 cwts. of straw.

The question arises—is this amount of increase due to the mineral manures applied during the 12 years of its production, or is the whole, or part of it, to be attributed to the previous accumulation? Doubtless part is due to previous accumulation, and part only to the direct effect of the newly-supplied mineral manure in enabling the plant to avail itself more fully of the natural supplies of the soil and season. Even were nearly the whole attributable to accumulation of nitrogen previously supplied, the amount is very small compared with that from direct nitrogenous manure. In fact, the limit of the effect of the unexhausted residue from the nitrogenous manuring of the earlier years is seen to be such, that it is obvious the average results of the different manures over the last 12 years, may, in most cases, be

TABLE XXV.—PRODUCE and INCREASE of WHEAT obtained during 1
with Mixed Mineral Manure, after 8 Years of liberal Nitroger
Mineral Manuring.

Plots.	MANURES, &c.	12 Years, 18 Total.
	Dressed Corn, per Acre; in Bushels and Pecks.	
5	Mixed Mineral Manure alone, every year	221 0¾
3	Unmanured, every year	185 3½
	Increase	35 1¼
	Weight per Bushel of Dressed Corn; lbs.	
5	Mixed Mineral Manure alone, every year	..
3	Unmanured, every year	..
	Increase	..
	Total Corn, per Acre; lbs.	
5	Mixed Mineral Manure alone, every year	13,888
3	Unmanured, every year	11,567
	Increase	2,321
	Total Straw (and Chaff), per Acre; lbs.	
5	Mixed Mineral Manure alone, every year	22,767
3	Unmanured, every year	19,940
	Increase	2,827
	Total Produce (Corn and Straw), per Acre; lbs.	
	Mixed Mineral Manure alone, every year	36,655
	Unmanured, every year	31,507
	Increase	5,148

taken as sufficiently nearly indicating their comparative effects in a practical point of view.

If, however, the increase on plot 5 during the 12 years is to be referred in any great part to previous accumulation, what an insignificant amount remains as the effect of the mixed mineral manure in restoring the productiveness of the wheat-exhausted soil. It will, perhaps, be said that it would have been greater if silica in an available form had also been supplied. Baron Liebig has, however, maintained that, provided there be a sufficiency of available alkali in the soil, there will never be a deficiency of available silica. Our own analytical results do not justify this conclusion in all its fulness. At the same time, it may be stated that the mixed mineral manure employed did supply a great excess of available alkali; and that when to the same mineral manure 400 lbs. of ammonia-salts were annually added there was a further annual increase of nearly 18 bushels of dressed corn, and nearly 20¾ cwts. of straw, notwithstanding the exclusion of silica from the manure.

The next selection of results affords even more direct and more striking evidence of the comparatively small immediate effects of the supposed unexhausted residue from previous nitrogenous manuring.

During the first 8 years of the experiments, plots 17 and 18 received much about the same amounts of nitrogen, potass, and phosphoric acid, and yielded about the same amounts of total produce as plot 5; plot 18, however, received rather less than the others. The accumulation of nitrogen and mineral constituents was, in fact, practically very nearly the same on all 3 plots. From this time, instead of receiving mineral manure every year as plot 5, each of the other two plots (17 and 18) received ammonia-salts and mixed mineral manures alternately. In other words, when plot 17 was manured with ammonia-salts, plot 18 was manured with the mixed mineral manure, and *vice versâ;* so that, each year, the one had ammonia-salts immediately succeeding the mixed mineral manure, and the other the mixed mineral manure immediately succeeding ammonia-salts. The detailed results of this most interesting experiment are recorded in the Appendix Tables, and some of them are exhibited in the coloured diagram No. II. (facing p. 461), to which reference will be made further on. But the point to which attention is now to be particularly directed is the amount of increase obtained when the mixed mineral manure each year succeeded ammonia-salts, as on plots 17 or 18, compared with that obtained when the same mixed mineral manure was employed year after year on the same plot, as on plot 5. Table XXVI. illustrates this point:—

TABLE XXVI.—PRODUCE of WHEAT by Mixed Mineral Manure each Year succeeding Ammonia-salts, compared with that by Mixed Mineral Manure Year after Year.

Plots.	MANURES, &c.	12 Years, 1852–1863. Total.	Average Annual.
	Dressed Corn, per Acre; in Bushels and Pecks.		
17 or 18	Mixed Mineral Manure, each year succeeding 400 lbs. Ammonia-salts	225 3¼	18 3¼
5	Mixed Mineral Manure, every year	221 0¾	18 1¾
	Increase	4 2½	0 1½
	Weight per Bushel of Dressed Corn; lbs.		
17 or 18	Mixed Mineral Manure, each year succeeding 400 lbs. Ammonia-salts	..	58·0
5	Mixed Mineral Manure, every year	..	57·9
	Increase	..	0·1
	Total Corn, per Acre; lbs.		
17 or 18	Mixed Mineral Manure, each year succeeding 400 lbs. Ammonia-salts	14,177	1181
5	Mixed Mineral Manure, every year	13,888	1157
	Increase	289	24
	Total Straw (and Chaff), per Acre; lbs.		
17 or 18	Mixed Mineral Manure, each year succeeding 400 lbs. Ammonia-salts	23,823	1985
5	Mixed Mineral Manure, every year	22,767	1897
	Increase	1,056	88
	Total Produce (Corn and Straw), per Acre; lbs.		
17 or 18	Mixed Mineral Manure, each year succeeding 400 lbs. Ammonia-salts	38,000	3166
	Mixed Mineral Manure, every year	36,655	3054
	Increase	1,345	11[illegible]

ming, as doubtless was the case, that at the commencement ots were practically in very nearly the same condition of iveness, it might be supposed that the mixed mineral applied each year after ammonia-salts, as on plots 17 or providing the most favourable conditions for the pro- effect of the unexhausted nitrogenous residue, would considerable increase beyond that on plot 5, where the manure each year succeeded mineral manure. Table shows, however, that plots 17 or 18 gave annually only bushel of corn, and $\frac{3}{4}$ cwt. of straw more than plot 5. average increase obtained in the years of the application nmonia-salts on plots 17 or 18, though always succeed- mineral manure, would carry off little more than one- f the nitrogen supplied; whilst, as the next Table I., p. 458) shows, this increase was considerably less ien the ammonia-salts were used in conjunction with, of in succession to, the mixed mineral manure.

, in the course of 12 years, an annual supply of 400 lbs. ionia-salts, each year succeeding the mixed mineral gave 45 bushels less corn, and 5475 lbs., or nearly 49 ess straw, than the same amount of ammonia-salts used ir in conjunction with the mixed mineral manure—being ige annual deficiency of about $3\frac{3}{4}$ bushels of corn, and iore than 4 cwts. of straw, where the ammonia-salts were the year after, instead of with the mineral manure. lding the average annual increase (over the unmanured) by the ammonia-salts succeeding the mineral manure, by the mineral manure succeeding the ammonia- e amount scarcely reaches that obtained where the two s were used in conjunction. That is to say, the influ- the mineral manure succeeding the ammonia-salts seems been to render practically available, at any rate no more nrecovered residue of the supplied nitrogen than brought increase in two years to that attainable in the one year ie two manures were used together, the whole of the ler being still unaccounted for, so far as the immediate : of crop is concerned.

facts brought to view in the last five Tables (XXIII.— .), are of great scientific interest, and of great practical nce.

s been alleged by Baron Liebig that, in some of our experi- here has been so much more nitrogen annually applied ire than taken off in the increase of crop, that after a few e increase obtained on a further addition was not at all he new supply, but would have been the same without it,

TABLE XXVII.—PRODUCE of WHEAT by Ammonia-salts each Year in conjunction with the Mixed Mineral Manure, compared with that by Ammonia-salts each Year succeeding the Mixed Mineral Manure.

Plots.	MANURES, &c.	12 Years, 1852–1863. Total.	12 Years, 1852–1863. Average Annual.
	Dressed Corn, per Acre; in Bushels and Pecks.		
7	400 lbs. Ammonia-salts and Mixed Mineral Manure, every year	436 2	36 1½
17 or 18	400 lbs. Ammonia-salts, each year succeeding Mixed Mineral Manure	391 1¾	32 2½
	Difference	45 0¼	3 3
	Weight per Bushel of Dressed Corn; lbs.		
7	400 lbs. Ammonia-salts and Mixed Mineral Manure, every year	..	58·4
17 or 18	400 lbs. Ammonia-salts, each year succeeding Mixed Mineral Manure	..	58·7
	Difference	..	0·3
	Total Corn, per Acre; lbs.		
7	400 lbs. Ammonia-salts and Mixed Mineral Manure, every year	27,306	2275
17 or 18	400 lbs. Ammonia-salts, each year succeeding Mixed Mineral Manure	24,652	2054
	Difference	2,654	221
	Total Straw (and Chaff), per Acre; lbs.		
7	400 lbs. Ammonia-salts and Mixed Mineral Manure, every year	50,539	4212
17 or 18	400 lbs. Ammonia-salts, each year succeeding Mixed Mineral Manure	45,064	3755
	Difference	5,475	457
	Total Produce (Corn and Straw), per Acre; lbs.		
	400 lbs. Ammonia-salts and Mixed Mineral Manure, every year	77,845	6487
	400 lbs. Ammonia-salts, each year succeeding Mixed Mineral Manure	69,716	5809
	Difference	8,129	678

rtue of the large accumulation within the soil from the ous manuring. The results adduced show that there is no ation in fact for this assumption.

s demonstrated that, of the nitrogen supplied in manure for , and not removed in the immediate increase of crop, so as remains in the soil is in such a state of combination, or bution, as to be extremely slowly recoverable by succeeding of the same description. How far such residue would be rapidly available to a succession of crops of different iptions, taking different ranges within the soil, and having ent habits, and requiring different conditions, of growth ier respects, is a very important question, both in a scientific ractical point of view. It would be impossible to consider iately in this place the evidence in our possession bearing this point; but it may be remarked, in passing, that it is our of the supposition that other plants grown in alterna-with the cereals do gather up, within a given time, more of itrogen supplied for, but unused by, the latter, than a suc-n of them would do; and even barley seems capable of ing, within a given time, a much larger proportion of the gen of manure not recovered in the immediate increase of rop than wheat.

though the excess of the nitrogen supplied in the manure id that taken off in the increase of the crop for which it ipplied had such little influence upon the next succeeding analysis of the soils from several of the experimental plots hown that there is an accumulation of nitrogen in some Nor can there be any doubt that, except in special cases, become richer rather than poorer in nitrogen in the course ltivation; showing a gradual accumulation of nitrogen beyond innually available for the crops. In illustration, it is suffi- to refer to the fact, that the percentage of nitrogen in ce-soils is found to be much higher than in the subsoils on h they rest; that is to say, it is the higher the more they xposed to the contact of the roots, the débris of the crops, ianure, and the atmosphere.

aving out of consideration the question whether or not there actual loss of a portion of the nitrogen supplied in the ire, either through the agency of the growing plant, or from ansformation of nitrogenous compounds within the soil, and oration in some form, or drainage beyond the reach of the , the obvious practical conclusion from the results hitherto ced in this Section is, that, of the nitrogen supplied in ire for the growth of wheat, a large proportion remains covered as increased yield in the immediate crop, and

is but very slowly, if ever fully, recovered in succee crops.

The next question to consider is, the degree, or limit, of effe succeeding crops, of the unexhausted residue of *mineral* man This point is illustrated in a very interesting manner in coloured diagrams (I. and II.) facing p. 461.

The results obtained on plots 3, 10*a*, and 10*b*, to which gram I. relates, will be first noticed. The diagram, which be easily understood on inspection, shows at one view the ge character of the manuring, and the bushels of corn obtained acre, on each of the plots, in each of the 20 years of the ex ments (harvests 1844-1863 inclusive); and the following more detailed description of the experiments and their result

Plot 3 was unmanured throughout the 20 years, and d several previous seasons.

Plots 10*a* and 10*b* had the same mineral manure in the year (1843-4). 10*a* had ammonia-salts in each of the 19 suc ing years. 10*b* had the same amounts of ammonia-salts i out of the 19 years; in the 3rd year of the experiments (184 was left unmanured, in the 5th (1848) it had mixed mi manure with the ammonia-salts, and in the 7th (1850) m mineral manure alone.

The following Table shows the total amounts of the diff manures applied per acre on each of the two plots (10*a* and during the 19 years, 1845-1863 inclusive:—

TABLE XXVIII.

	Plot 10*a*.	Plot 10*b*.	1 over o 1
	lbs.	lbs.	1
Sulphate of Ammonia	3692	3268	+
Muriate of Ammonia	3468	3268	+
Bone-ash	..	400	–
Sulphuric Acid (Sp. gr. 1·7)	..	300	–
Pearl-ash	..	600	–
Soda-ash	..	400	–
Sulphate of Magnesia	..	200	–

the 1st year (1843-4), although the land was in that practical exhaustion consequent on the removal of tur ey, peas, wheat, and oats since the last application of farm manure, plots 10*a* and 10*b*, manured with silicate of potas superphosphate of lime, gave less than half a bushel of dr ... and only 77 lbs of total produce more, per acre, tha ...manure ... plot (3)

WHEAT

r Year,

Plots.	1844.	1845.	1846.	1847	1855.
					in Bushels
3	15 0	23 0¾	17 3¾	16 3	17 0
10a	15 1¾	31 3¼	27 1½	25 3	19 3½
10b		31 3¼	17 2½	25 2	28 0

ral Manu

Plots.	1852.	1853.	1854.	1855	1863
					, in Bushel
3	13 3¼	5 3¼	21 0¼	17 0	17 1
5	16 3½	10 0½	24 0¾	18 1	19 2
17	24 3¾	8 2¾	44 0½	18 0	21 1
18	14 1¼	19 1¼	23 3¼	33 0	46 1
10a	21 3½	9 3¾	34 1½	19 3	39 0
10b	22 0¼	15 2	39 0¾	28 0¼	43 2
7	26 3	23 2¼	45 1½	33 0½	53 2

2nd year (1845), $10a$ and $10b$ were both manured with
-salts at the rate of 336 lbs. per acre, and gave rather
n 31¾ bushels of dressed corn, and rather more than
of straw, against scarcely 23¼ bushels of dressed corn,
24¼ cwts. of straw, on plot 3 without manure. Thus,
mixed mineral manure gave scarcely any increase what-
the first year, ammonia-salts alone gave an increase of
ore than 8½ bushels of dressed corn, and about 13¾ cwts.
, in the second.
e 3rd season (1845-6), $10a$ being again manured with
a-salts, gave nearly 27½ bushels of dressed corn, and 20
straw, against not quite 18 bushels of dressed corn, and
ts. of straw, on the continuously unmanured plot (3).
ia-salts, again used alone, gave, therefore, an increase
y 9½ bushels of dressed corn, and about 6½ cwts of straw.
t $10b$ was left this year unmanured, and it gave about
l less dressed corn, and ½ cwt. less straw, than plot 3.
hen, neither the unexhausted residue of the mineral
supplied in 1844, nor that of the ammonia-salts supplied
, gave any increase in 1846.
4th year (1846-7), plots $10a$ and $10b$, so differently treated
preceding year, were again equally manured with am-
alts alone. The result was, almost identical amounts of
rn and straw in the two cases, and an increase over the
ured plot of nearly 9 bushels of dressed corn, and about
. of straw.
e 5th year (1847-8), the two plots again received equal
s of ammonia-salts, but $10b$ had in addition a mineral
supplying potass, soda, magnesia, lime, sulphuric acid,
sphoric acid. Plot $10b$ was, therefore, in a more favour-
ndition than plot $10a$, not only by virtue of this direct
of mineral constituents, but also on account of the less
ion of them in 1846, when, being left unmanured, it gave
h less both of corn and straw than plot $10a$. The result
t, with 14¾ bushels of dressed corn on the unmanured
), $10a$, with ammonia-salts alone for the 4th time, gave
d $10b$, with ammonia-salts for the 3rd time, and with
manure in addition, rather over 25 bushels; and the
s of straw were, on plot 3, 15¼, on plot $10a$ rather more
, and on plot $10b$ rather more than 26 cwts. There was,
e, an increase of 4½ bushels of dressed corn, and 5¾ cwts.
, on plot $10a$; and of 10¼ bushels of dressed corn, and
ts. of straw, on plot $10b$; or a difference in favour of $10b$,
the greater abundance of mineral constituents, of nearly
ls of dressed corn, and of 5 cwts. of straw. There was,
ready in the 4th year of the application of the ammonia-

salts alone, evidence of considerable relative deficiency of available mineral constituents, notwithstanding the application in the 1st year of silicate of potass and superphosphate of lime. Nor is this to be wondered at when it is considered that, in the 4 crops grown by ammonia-salts alone, there would probably be more than five times as much potass, about three times as much phosphoric acid, and more than thirty times as much silica removed from the land, as would be lost to it in a whole course of rotation of turnips, barley, clover, and wheat—supposing only the corn and meat to be sold, and the manure produced from the straw, and the consumption of the roots and clover, to be returned to the land.

In the 6th year (1848-9) both plots were again equally manured with ammonia-salts alone, and they gave almost identical quantities of dressed corn, amounting to about $13\frac{1}{4}$ bushels more than that on the unmanured plot; whilst, of straw, 10*a* gave an increase of about 11 cwts., and the much less exhausted plot 10*b* only about 1 cwt. more.

In the 7th year (1849-50), 10*a* again received ammonia-salts alone, and gave nearly 27 bushels of dressed corn and $27\frac{1}{2}$ cwts. of straw, which was equal to an increase over the unmanured produce of nearly 11 bushels of corn and about $12\frac{1}{4}$ cwts. of straw. 10*b*, on the other hand, had a manure supplying liberally every mineral constituent at all likely to be wanting, except silica, but containing no ammonia, and the result was an increase over the unmanured plot of little over 2 instead of 11 bushels of dressed corn, and of only about 2 instead of $12\frac{1}{4}$ cwts. of straw. Thus, even in the 6th year of their application, ammonia-salts alone gave 9 bushels more dressed corn and nearly $10\frac{1}{4}$ cwts. more straw, than the mixed mineral manure alone, notwithstanding that a relative deficiency of mineral constituents had shown itself 2 years previously, and that even on 10*b*, where so much less ammonia-salts had been applied in previous years, there had still been considerably more than twice as much nitrogen supplied as had been recovered as increased yield in the crop. The defective result on 10*b*, by the mineral manure alone, could not be due to the want of available silica, since the exhaustion of it was very much less than on 10*a*, which, nevertheless, gave so much more produce. It is, moreover, clear that, although the available supply of mineral constituents had become defective in relation to the amount of ammonia artificially supplied, it was still in excess relatively to the annually available supply of nitrogen from natural sources.

From this time forward, for 13 consecutive years, plots 10*a* and 10*b* received exactly the same amount of ammonia-salts annually (200 lbs. sulphate and 200 lbs. muriate), and neither of

uny mineral manure. During the first 2 years, the two previously so differently manured, gave almost identical ts of produce; but from that time forward, 10*b*, which, in lier years, had the ammonia-salts omitted twice, and twice ed the mixed mineral manure when 10*a* had none, gave year several bushels of corn (with its proportion of straw) han 10*a*.

s clear that 10*a* had become relatively very deficient in mineral constituents. Nor is this to be wondered at the circumstances of the experiment are considered. To othing of silica and other constituents, the first 7 crops from 10*a* removed about $1\frac{1}{2}$ time as much phosphoric acid, ore than twice as much potass, as were supplied in the ear (1843-4). On the other hand, 10*b* received in manure the same 7 years, more than $1\frac{1}{2}$ time as much phosphoric and more than twice as much potass, as were removed in ops. In other words, 10*a* was already much poorer, and uch richer, in both phosphoric acid and potass, than at the encement.

hese circumstances are borne in mind the Summary XXIX., given overleaf, will have considerable interest.

ing the 6 years, 1845-1850, plot 10*a* received 424 lbs. ulphate and 200 lbs. more muriate of ammonia than plot out during the same period plot 10*b* received 600 lbs. pearl-00 lbs. soda-ash, 200 lbs. sulphate of magnesia, 400 lbs. sh, and 300 lbs. sulphuric acid (sp. gr. 1·7), whilst plot eceived no mineral manure. The result was, that whilst lots gave a considerable increase, 10*a* gave a total of $13\frac{1}{4}$ s of dressed corn, and 1278 lbs., or about $11\frac{1}{2}$ cwts., of more than 10*b*—equal to an average annual increase of $2\frac{1}{4}$ s of dressed corn and nearly 2 cwts. of straw, due to the amount of ammonia-salts, notwithstanding the much more able condition of 10*b* as to mineral constituents.

er the next 13 years, 1851-1863, during which neither plot ed mineral manure, and both the same amount of ammonia-annually, 10*a*, previously so much more exhausted of al constituents, gave $51\frac{1}{2}$ bushels of dressed corn, and 5483 r about 49 cwts., of straw less than 10*b*—equal to an average l deficiency of nearly 4 bushels of dressed corn, and of $3\frac{3}{4}$ of straw. It is worthy of remark, however, that although ontinues to give notably more produce than 10*a*, due to the y, and to the less exhaustion, of mineral constituents during rlier years, it appears to be of late progressively declining nal yield, and even somewhat more rapidly than 10*a*; for, average annual produce of the last 6 years be compared

with

TABLE XXIX.—PRODUCE of WHEAT on PLOT 10*a* compared with that on 10*b*, during the 6 Years, 1845—1850, the 13 Years, 1851—1863, and the whole 19 Years, 1845—1863.

Plot 10*a*. Ammonia-salts every Year.
Plot 10*b*. Without Manure the 2nd Year, with Mineral Manure the 4th and 6th Years, and Ammonia-salts the 1st, 3rd, 4th, 5th, 7th, and succeeding Years.

Plots.	6 Years, 1845—1850.		13 Years, 1851—1863.		19 Years, 1845—1863.	
	Total.	Average Annual.	Total.	Average Annual.	Total.	Average Annual.
Dressed Corn, per Acre; in Bushels and Pecks.						
10*a*	163 2¾	27 1¼	300 1¼	23 0½	464 0	24 1¾
10*b*	150 1¾	25 0¼	351 3½	27 0½	502 1¼	26 1¾
10*a* over or under 10*b*	+13 1	+2 1	−51 2¼	−4 0	−38 1¼	−2 0
Weight per Bushel of Dressed Corn; lbs.						
10*a*	..	60·3	..	56·3	..	57·6
10*b*	..	60·6	..	57·4	..	58·4
10*a* over or under 10*b*	..	−0·3	..	−1·1	..	−0·8
Total Corn, per Acre; lbs.						
10*a*	10,728	1788	19,194	1476	29,922	1575
10*b*	9,833	1639	22,254	1712	32,087	1689
10*a* over or under 10*b*	+895	+149	−3,060	−236	−2165	−114
Total Straw (and Chaff), per Acre; lbs.						
10*a*	17,708	2951	34,302	2639	52,010	2737
10*b*	16,430	2738	39,785	3060	56,215	2958
10*a* over or under 10*b*	+1,278	+213	−5,483	−421	−4,205	−221
Total Produce (Corn and Straw), per Acre; lbs.						
10*a*	28,436	4739	53,496	4115	81,932	4312
10*b*	26,263	4377	62,039	4772	88,302	4647
10*a* over or under 10*b*	+2,173	+362	−8,543	−657	−6,370	−335

that of the preceding 6, it is found that, whilst 10*a* has given
ishel of dressed corn and 180 lbs. of straw, 10*b* has given
ushel of dressed corn and 304 lbs. of straw, less over the
than over the earlier period.

ver the whole 19 years, plot 10*a*, with its larger amount of
onia-salts and less supply of mineral constituents, gave
bushels of dressed corn, and 4205 lbs., or about 37½ cwts., of
less than 10*b*—equal to an average annual deficiency of 2
els of dressed corn, and nearly 2 cwts. of straw.

ere, then, is an obvious case of exhaustion of available
ral constituents relatively to the available supply of nitrogen,
also a very marked effect from the unexhausted residue of the
ral manures applied in the earlier years.

would be inappropriate to go into detail as to the compara-
exhaustion of the two plots in respect to individual mineral
ituents without adducing the results of analysis relating to
subject. But it may be stated generally, that the average
ntage of mineral matter is considerably lower in the pro-
of plot 10*a*, than in that of plot 3 without manure; and
er, that in the ash of the grain the proportion of phosphoric
and in that of the straw the proportion of the silica more
cularly, is becoming reduced. During these 19 years, how-
there have been removed from the plot as much phosphoric
as would suffice for more than 50 years, as much potass as
d suffice for more than 100 years, and as much silica as
d suffice for more than 500 years of ordinary rotation, where
corn and meat are sold, and the due proportion of the home-
ires are periodically returned to the land; whilst the first
rops of the twenty would remove about as much phosphoric
and the first three about as much potass, as was supplied
e first year of the experiments.* Under such very un-
treatment, it is certainly not surprising that the annually
ble mineral constituents of the soil should prove to be
icient.

agram II. (facing p. 461), further illustrates the point in
ion. There are there shown, side by side, the bushels of
ed corn per acre, in each of the last 12 years of the experi-
s, on plots 3, 5, 17, 18, 10*a*, 10*b*, and 7; and the further

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iron Liebig tells his readers that we applied in the first year as much soluble
oric acid as would be contained in about 1750 lbs. of guano. The fact
the total phosphoric acid applied would be contained in about one-half
nount of Peruvian guano of average composition. He also misrepresents
nclusions; and so, as in other instances, by the aid of his own mis-
ents, makes a point for ridicule where he cannot controvert. (Einleitung
Natural Laws of Husbandry,' p. 300, and context.)

conditions and results of the different experiments will be sufficiently understood from the following few comments.

It is seen, as shown in another form in Table XXVI., that plots 5, and 17 or 18, give almost identical amounts of average annual produce, and therefore of average annual increase over plot 3, during the 12 years in question—the one (plot 5) having mixed mineral manure alone every year, but succeeding heavy dressings of mineral manure and ammonia-salts in preceding years, and the others having the same mixed mineral manure each year succeeding an excess of ammonia-salts in the preceding year, and succeeding also, as on plot 5, mixed mineral manure and ammonia-salts in the earlier years.

But the point which it is the chief object of Diagram II. to illustrate is, the very different effect of a given amount of ammonia-salts according to the supply of available mineral constituents within the soil.

During each of the 12 years, plots 10*a*, 10*b*, 17 or 18, and 7, each received exactly the same amount of ammonia-salts; and, taking the results of each year separately, the order as to amount of produce is, invariably—plot 7 (highest), 17 or 18, 10*b*, and 10*a* (lowest); that is, the lowest where the mineral constituents were the most exhausted, and the highest where their supply was most liberal.

The point is also well illustrated by reference to the average annual results over the 12 years. Thus, the average annual increase (over the unmanured produce) was:—on 10*a*, with ammonia-salts alone (not only each year of the 12, but for several years previously), 7⅛ bushels of dressed corn, and nearly 8½ cwts. of straw; on 10*b*, also with ammonia-salts alone every year of the 12, and for some years previously, but with mineral manure in two of the seven preceding years, nearly 11½ bushels of dressed corn and 12½ cwts. of straw; on 17 or 18, where ammonia-salts each year succeeded mineral manure, 17⅛ bushels of dressed corn, and nearly 18¾ cwts. of straw; and, lastly, on plot 7, with the ammonia-salts and mixed mineral manure used each year together, nearly 21 bushels of dressed corn, and 22¾ cwts. of straw.

With the same amounts of ammonia-salts, therefore, there was a difference in the amount of increase of produce annually obtained of from 7⅛ bushels of dressed corn and nearly 8½ cwts. of straw, to 20⅞ bushels of corn and 22¾ cwts. of straw, according to the supply of available mineral constituents within the soil. There was a difference of from 7⅛ bushels of corn and nearly 8½ cwts. of straw, to nearly 11½ bushels of corn and 12½ cwts. of straw, due to the application of mineral manure twice in the earlier years of the experiments (10*b*); and there was a difference

›m 17¼ bushels of dressed corn and nearly 18¾ cwts. of , to 20⅞ bushels of corn and 22¾ cwts. of straw, due to the cation of the mixed mineral manure each year in conjunction the ammonia-salts, instead of each year preceding them as ots 17 or 18.

the greater amount of increase on 10*b* than on 10*a*, there is ng evidence of the permanent and lasting effect of the unexed residue of the artificially applied mineral constituents, ly available nitrogen be provided within the soil. On the hand, the greater amount of increase on plot 7 than on 17 or 18, shows the much greater effect of the mineral ituents when applied at the same time with the ammonia- Nevertheless, there is no doubt that even plots 17 and 18 ved much more of all those mineral constituents that were lied than was removed of them in the crops. The con- n and distribution of the constituents within the soil, would, ver, be very different in the two cases.

ie very interesting and important results which have been y passed in review in this Section, especially those to which coloured Diagrams refer, may be still more briefly sum- ied as follows:—

A somewhat heavy loam, of fair average wheat-producing ty, taken at the end of a five-course rotation since manuring, scarcely any increased produce of wheat in the year of the cation when manured with a mixture of silicate of potass superphosphate of lime; but it gave a very considerable, h progressively diminishing, amount of increase, when vards manured for 19 consecutive years with ammonia-salts

It is obvious that, taken in the condition of practical stion specified, the soil still contained an excess of annually ble mineral constituents, relatively to the annually avail- nitrogen supplied by soil and season without manure. i, however, large quantities of ammonia-salts were annually ed, the relative deficiency of mineral constituents became ent, even as early as the fourth year of their application.

When ammonia-salts were applied, the greater portion of trogen remained unrecovered as increased yield in the crop hich it was employed.

The unexhausted residue of nitrogen supplied as manure, out very partially and very slowly recovered as increased in succeeding years, even when followed by the liberal cation of such mineral manure as was very effective when in conjunction with newly applied ammonia-salts.

Mineral constituents supplied in the soluble form in the nd 7th years of the experiments (though giving very little

increase when in the latter year they were used alone), continued to increase the effect of ammonia-salts afterwards annually applied for 13 consecutive years.

6. A given amount of ammonia-salts gave very different amounts of increase, according to the supply of available mineral constituents within the soil; giving very much more when mineral manures were applied in the same, than in the preceding year, notwithstanding that, in the latter case, there could be no deficiency, though doubtless less favourable condition and distribution of the mineral constituents.

7. The same mineral manures which were very effective when supplied with ammonia-salts, gave very little increase of produce when used alone year after year for 12 years, although following an excess of ammonia-salts applied in preceding years; and they gave very little more when they were applied every year succeeding an excess of ammonia-salts applied in the immediately preceding year.

8. The unexhausted residue from previous mineral manuring, though it served as an effective reserve against exhaustion, had little or no effect in increasing the growth of wheat without the aid of available nitrogen provided within the soil. An unexhausted residue from previous nitrogenous manuring had also but little influence upon the immediately succeeding crops, even when aided by the application of mineral manures.

The bearing of the facts adduced in this Section, upon the question of the probable influence on the mineral wealth of our soils, of the use of artificial nitrogenous manures, under the circumstances, and in the degree, in which they are generally employed in the ordinary course of agriculture in this country, will be considered further on, when the whole of the experimental evidence which it is proposed to bring forward in the present Report is before the reader.

With regard to the bearing of the results on the subject of the next Section, it is obvious that the degree and limit of effect of the unexhausted residue of previous manuring, whether nitrogenous or mineral, are such that, if the circumstances of the different plots are duly considered, there will be little danger of misinterpreting the results obtained on the application of the different manures year after year on the same plot during the last 12 years.

III. Average annual results over the last 12 years.

Subject to such reservations as the facts already adduced suggest, and to others which will be referred to in the course of the discussion, attention may now be directed to the average annual

lts over the last 12 years, from each description of manure ied year after year on the same plot, during the whole of period. These are given in Table XXX., pp. 470, and 471. details of the manures are given in Appendix Table IX., are further explained in the Notes at p. 163, facing that le. The details of the produce of each separate plot in each rate year will be found in Appendix Tables X.—XXVI., 164-185.

may be explained that in the Summary Table XXX., rever the plots are divided into two (*a* and *b*), and both por- s are manured alike, giving duplicate experiments and results, mean of the two only is given.

Average Annual Produce without Manure.

here were three plots entirely unmanured during the last ears of the experiments to which the results in Table XXX. . Plot 3, had been unmanured for the 8 preceding years as well as during the 5 years of rotation before the experi- :s commenced. Plot 20, which was at the other side of the had been unmanured the same number of years as plot 3, the exception that in the third year it received a mixture of urplus of the artificial manures used on the other plots. Plot 4 been unmanured during the last 12 years only; during the eding 7 years it had been manured with large quantities of rphosphate of lime and sulphate of ammonia, and in the first of the 20 was manured with the ashes of farmyard manure.

ot 3, which had grown wheat without manure for the whole ears, and plot 20 for 19 out of the 20, gave almost identical ige annual amounts of produce over the last 12 years. On st every point, however, plot 20 gave slightly the better t; but the difference is so small that the experiments mutually rm each other, and the produce of plot 3 (continuously un- ired) is adopted as the standard by which to compare that e manured plots.

; average annual yield per acre over the 12 years was 15½ els of dressed corn, and 1662 lbs. or nearly 15 cwts. of straw. average weight per bushel of the dressed corn was lower than ly case but two of the manured produce; but the proportion rn to straw was almost exactly the same as with farmyard ire, and higher than in most cases with artificial manure.

ie tendency to produce a fair proportion of corn to straw was, fore, without manure, more than equal to that under the rity of the conditions with manure; and the low weight per el was, doubtless, due to the sluggish growth and consequent :tive power of ripening.

Plot 4,

EXPERIMENTS AT ROTHAMSTED ON THE GRO[W...]

TABLE XXX.—AVERAGE PRODUCE, and INCREASE by M[...]

Plots.	Manures per Acre, per Annum, for 12 Years; 1852-1863. (For further particulars *see* Appendix Table IX. and Notes, pp. 162-3; and for the Manures previous to 1852 *see* Appendix Tables I.-VIII. pp. 146-161).	PRODUCE, [...] Dressed Corn. Quantity. bush.	pks.	Weigh[t] per Bushel. lbs.
2	14 Tons Farmyard Manure, every year (20 years, 1844-63)	35	1½	59·3
3	Unmanured (20 years, 1844-63)	15	2	56·5
20	Unmanured (17 years, 1847-63)	15	2½	57·0
4	Unmanured (12 years, previously Superphosphate of Lime and Ammonia-salts)	16	3¾	57·2
0	Superphosphate of Lime[1] (16 years, 1848-63)	18	1	57·5
1	Sulphates of Potass, Soda, and Magnesia (15 years, 1849-63)	16	1½	57·2
5 (*a & b*)	Mixed Mineral Manure[2]	18	1¾	57·9
21	100 lbs. Muriate Ammonia, and Mixed Mineral Manure ..	22	0¾	57·9
22	100 lbs. Sulphate Ammonia, and Mixed Mineral Manure ..	21	2¾	57·8
6 (*a & b*)	200 lbs. Ammonia-salts[3], and Mixed Mineral Manure ..	28	1¼	58·6
7 (*a & b*)	400 lbs. Ammonia-salts, and Mixed Mineral Manure	36	1¾	58·4
8 (*a & b*)	600 lbs. Ammonia-salts, and Mixed Mineral Manure	38	0	57·8
16 (*a & b*)	800 lbs. Ammonia-salts, and Mixed Mineral Manure	38	2	57·6
17 (*a & b*) or 18 (*a & b*)	Mixed Mineral Manure (in alternation with 400 lbs. Ammonia-salts)	18	3½	58·0
	400 lbs. Ammonia-salts (in alternation with Mixed Mineral Manure)	32	2½	58·7
10 (*a*)	400 lbs. Ammonia-salts, alone (19 years Ammonia-salts alone, 1845-63)	22	2½	55·9
10 (*b*)	400 lbs. Ammonia-salts, alone (13 years, 1851-63)	26	3¾	57·0
11 (*a & b*)	400 lbs. Ammonia-salts, and Superphosphate of Lime ..	29	2¼	56·5
12 (*a & b*)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Soda	35	0¾	58·3
13 (*a & b*)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Potass	34	2¼	58·6
14 (*a & b*)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Magnesia	35	0	58·3
[illegible] (*a*	550 lbs. Nitrate of Soda, and Mixed Mineral Manure[4] ..	34	2	57·1
[illegible] (*b*	550 lbs. Nitrate of Soda, alone[5]	25	3½	55·4
[illegible] *a*	400 lbs. Ammonia-salts, Mixed Alkalies[6], and Superphosphate of Lime[7]	33	0¾	58·[illegible]
	300 lbs. Ammonia-salts, Mixed Alkalies,[6] Superphosphate of Lime,[7] and 500 lbs. Rape-Cake	34	3½	58·[illegible]
	300 lbs. Ammonia-salts, Superphosphate of Lime,[7] and 500 lbs. Rape-cake	31	2¾	58·[illegible]

[1 "Su]perphosphate of Lime"—4 parts Bone-ash, and 3 parts Sulphuric Acid, Sp. gr. 1·7.
[2 "Mi]xed Mineral Manure"—Superphosphate of Lime, and Sulphates of Potass, Soda, and Magn[esia.]
[3 "A]mmonia-salts"—equal parts Sulphate and Muriate of Ammonia of Commerce.
[4 T]he Mixed Mine[ra]l Man[u]re not applied until the 12th Season 1854-5; and only 475 lb[s.]

...t Year after Year on the same Land.

...re, per Annum, over 12 Years, 1852-63.

...oduce, &c.		Increase.											
		Dressed Corn.				Total Corn.		Straw and Chaff.		Total Produce.			
Total Produce (Corn and Straw).	Corn to 100 Straw.	Over Un-manured (Plot 3).		Over Mixed Mineral Manure (Plots 5a & b).		Over Un-manured (Plot 3).	Over Mixed Mineral Manure (Plots 5a & b).	Over Un-manured (Plot 3).	Over Mixed Mineral Manure (Plots 5a & b).	Over Un-manured (Plot 3).	Over Mixed Mineral Manure (Plots 5a & b).	Plots.	
lbs.		bush.	pks.	bush.	pks.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
6101	57·9	19	3½	..		1268	..	2207	..	3475	..	2	
2626	57·8	..		..		..	..	..	..	..	..	3	
2703	57·9	0	0½	..		25	..	52	..	77	..	20	
2804	61·6	1	1¾	..		108	..	70	..	178	..	4	
2989	61·9	2	3	..		179	..	184	..	363	..	0	
2792	58·0	0	3½	..		61	..	105	..	166	..	1	
3054	62·0	2	3¾	..		193	..	235	..	428	..	5 (a & b)	
3727	59·7	6	2¾	3	3	420	227	681	446	1101	673	21	
3670	59·0	6	0¾	3	1	398	205	646	411	1044	616	22	
4783	59·0	12	3¼	9	3½	807	614	1350	1115	2157	1729	6 (a & b)	
6487	54·1	20	3½	17	3¾	1311	1118	2550	2315	3861	3433	7 (a & b)	
7097	50·4	22	2	19	2¼	1418	1225	3053	2818	4471	4043	8 (a & b)	
7577	47·3	23	0	20	0¼	1461	1268	3490	3255	4951	4523	16 (a & b)	
3179	59·7	3	1½	0	1¾	223	30	330	95	553	125	17 (a & b)	or
5809	55·0	17	0½	14	0¾	1090	897	2093	1858	3183	2755	18 (a & b)	
4038	54·0	7	0½	4	0¾	471	278	941	706	1412	984	10 (a)	
4754	54·6	11	1¾	8	2	729	536	1399	1164	2128	1700	10 (b)	
5092	57·1	14	0½	11	0¾	895	702	1571	1336	2466	2038	11 (a & b)	
6147	55·7	19	2¾	16	3	1236	1043	2285	2050	3521	3093	12 (a & b)	
6173	54·9	19	0¼	16	0⅓	1220	1027	2327	2092	3547	3119	13 (a & b)	
6199	54·9	19	2	16	2¼	1234	1041	2339	2104	3573	3145	14 (a & b)	
6587	48·5	19	0	16	0¼	1197	1004	2764	2529	3961	3533	9 (a)	
4808	49·8	10	1¼	7	1½	657	464	1525	1290	2182	1754	9 (b)	
5883	54·9	17	2¾	14	3	1124	931	2133	1898	3257	2829	15 (a)	
6214	54·4	19	1½	16	1¾	1222	1029	2366	2131	3588	3160	15 (b)	
5537	57·2	16	0¾	13	1	1052	859	1859	1624	2911	2483	19	

...for the 9th, and 275 lbs. for the 10th, and 11th Seasons.

...in the 9th Season only 475 lbs. of Nitrate of Soda.

...d Alkalies"—Sulphates of Potass, Soda, and Magnesia.

...Plots 15a, 15b, and 19, the Bone-ash decomposed by Muriatic Acid of Commerce, instead of Sulphuric Aci...

Plot 4, unmanured for the 12 years only, and manured for 7 previously with superphosphate of lime and ammonia-salt for 1 year with the ashes of farmyard dung (supplying very more phosphoric acid than was removed in the crops, an siderably more of nitrogen and of every mineral constituen was removed in the increase of the crops), gave an annual a during the subsequent 12 years of nearly 1½ bushel of d corn, and a little straw also, more than either plot 3 or p Bearing this difference in mind, we shall see that the accords very well with that of the other unmanured plots; shown more in detail in Section II., usefully indicates the of effect on immediately succeeding crops of an unexh residue from previous manuring. It is worthy of remark ever, that the produce of this plot had nearly as high portion of corn to straw as that of any in the entire series only surpassed on this point by that of plots 0 and 5, on as on plot 4, phosphoric acid would be present in larg portion relatively to other constituents, when compared w condition of other plots in this respect.

An average annual produce of wheat, amounting to fron 16 bushels of corn, and from 15 to 16 cwts. of straw, v manure of any kind, is looked upon by many as an extraor yield, and as indicating a somewhat unusual quality of land. is no doubt that it bears a higher proportion than might pected, to the produce obtained, even under rotation with per manuring, in a large majority of cases where land is badly f and deficient range and aeration of soil, luxuriant wee defective manuring, have all their share in the miserable The experimental land, though kept extremely clean, w however, ploughed more deeply than in the ordinary pra the farm; and, there can be little doubt, that a large propo those soils of the country which are recognised as pos average wheat-producing qualities, would yield very results, if kept equally clean and otherwise as well cult whilst some would, under like conditions, produce much nough many light soils probably much less.

Ave age Annual Produce by Farmyard Manure.

The average annual produce by farmyard manure over 2 years was 35⅜ bushels of dressed corn, and 3869 lbs. o 34½ cwts. of straw; equal to an average annual increase o produce of plot 3 of nearly 20 bushels of corn, and nearly 2 1 ton of straw.

has been already pointed out (see Table XXIII. an hereon), whilst the average annual produce as nearly the same during the earlier and th

years, that by farmyard manure was very much greater over the last 10 than the first 10 years of the experiments; though it increased in a considerably less degree during the last 6 as compared with the preceding 6 years.

The total produce during the 20 years was, without manure, 324$\frac{5}{8}$, and with farmyard manure 648$\frac{7}{8}$ bushels of dressed corn; and without manure 302$\frac{1}{4}$, and with farmyard manure 627$\frac{3}{4}$ cwts. of straw; or almost exactly double the amount of corn, and more than double the amount of straw, with the farmyard manure. It further gave nearly double as much average annual increase of corn, and more than 1$\frac{1}{2}$ times as much increase of straw, over the second as over the first 10 years; and whilst the weight per bushel of the dressed corn was, without manure lower during the later than during the earlier half of the period, with the farmyard manure it was higher during the later period.

During the whole 20 years 280 tons of farmyard manure were applied per acre, and there have been yielded about 18$\frac{1}{2}$ tons of corn and nearly 31$\frac{1}{2}$ tons of straw, equal to nearly 50 tons of total produce. The manure applied would not only convey to the land more of every constituent than was contained in the increase of crop, but nearly twice as much dry organic matter, and much more than twice as much of nitrogen, phosphoric acid, and potass (and probably every other mineral constituent), as was contained in the total produce removed from the land. There has, therefore, been a great accumulation of constituents by the soil. No wonder, then, that the plot should yield such a much higher average annual produce during the later than during the earlier years. On the other hand, several of the artificial manures gave a considerably higher average produce than the farmyard manure; and whilst several gave more than 50 bushels in the twentieth season, 1863, without any artificial supply of either available silica or carbonaceous organic matter during the whole period of the experiments, the farmyard manure gave only 44 bushels, and also less straw. It gave, however, the highest weight per bushel in the series.

A consideration of the results obtained by the other manures will indicate to which of the constituents of the farmyard manure its effects were mainly due, and which were superfluous, if not even in some way instrumental in limiting the productive activity of the constituents associated with them.

Average Annual Produce by Mineral Manure alone.

Plots 0, 1, and 5 had each mineral manure alone during the last 12 years.

Plot 0 was manured with a large quantity of superphosphate

of lime alone in each of the 12, and in the 4 preceding years, and previously with Peruvian guano or the mixture of the surplus of the other manures. Under these conditions the average annual produce during the last 12 years was 18¼ bushels of dressed corn, and 1846 lbs., equal about 16½ cwts. of straw; equivalent to an average annual increase over the unmanured plot of only 2¾ bushels of corn, and 184 lbs. of straw, and to a deficiency compared with the produce by farmyard manure of about 17 bushels of corn, and 18 cwts. of straw. Since a portion of the small increase was, doubtless, due to the unexhausted residue of previous nitrogenous manuring, it is obvious that but little remains to be attributed to the subsequent annual supply of superphosphate of lime. It is obvious, too, that if it were in mineral constituents that the soil had become relatively deficient by the previous cropping, it was not for want of phosphoric acid alone that the plot yielded so little more produce than was obtained without manure, and so much less than was obtained with farmyard manure.

Nor was it in potass, soda, magnesia, and sulphuric acid alone, that the soil had become relatively exhausted; for on plot 1 these constituents were supplied liberally every year for 15 consecutive years, and the average annual produce and increase over the 12 years were even less than on plot 0 with superphosphate of lime. The increase over the unmanured produce was, in fact, not quite 1 bushel of dressed corn, and not quite 1 cwt. of straw, per acre per annum.

Plot 5, was manured with a mixture of both superphosphate of lime, and the sulphates of potass, soda, and magnesia, supplying to the soil much more of probably every mineral constituent, except silica, than was taken off in the crops. But this mixture gave scarcely any more increase than the superphosphate of lime alone, and part of that which it did give has been shown to be most probably due to the unexhausted residue of previous nitrogenous manuring.

It was not, therefore, for want of mineral constituents, unless of available silica, that the soil had become, by the previous cropping, incapable of producing full wheat crops. The defective result, as compared with that by farmyard manure, was obviously due to the want of some constituent which was supplied by it, but not in either of the artificial mineral manures. The question is, arose—was the wanting constituent available silica?—was it organic matter yielding carbon to the plant?—or was it nitrogen in some available form of combination? These questions will be pretty satisfactorily answered by the results considered in the next Section.

verage Annual Produce by Mineral Manure and Ammonia-Salts.

he plots included in this series are Nos. 21, 22, 6, 7, 8, 16, to each of which exactly the same mixed mineral manure sisting of superphosphate of lime and the sulphates of potass, , and magnesia) was applied as that which was used alone lot 5, and then gave less than $18\frac{1}{2}$ bushels produce, and less 3 bushels' increase of dressed corn; but it was now em- ed in conjunction with ammonia-salts, in amounts varying 1 100 lbs. to 800 lbs. per acre per annum.

n plot 21 the mixed mineral manure was used with 100 lbs. he muriate, and on plot 22 with 100 lbs. of the sulphate of nonia of commerce. The muriate contained rather more nonia than the sulphate, and gave rather more than 22 bushels, lst the latter gave rather less, and also rather less straw. The ease over the produce by the mixed mineral manure alone, $3\frac{3}{4}$ bushels of corn and 4 cwts. of straw with the muriate, $3\frac{1}{4}$ bushels of corn and rather less than $3\frac{3}{4}$ cwts. of straw 1 the sulphate. In each case, therefore, the addition of lbs. of ammonia-salt to the mixed mineral manure, gave e increase over the produce by the mineral manure alone, 1 was obtained over the unmanured produce by the use of the eral manure itself, though it supplied annually an abundance otass, soda, magnesia, lime, phosphoric acid, and sulphuric

et the proportion of increase obtained for a given amount of nonia in these two experiments was less than is usual when 1 moderate quantities are used. Indeed, the results which w will show that it was considerably less than when twice, even four times as much ammonia was employed with the e mineral manure. The fact is, plots 21 and 22 were com- tively short lengths of land, so near to the hedge-green as to o some extent affected by trees (especially 21), and they were brought under exact experiment in the ninth and succeeding s as being the most eligible of the remaining unallotted por- s of the experimental field. Their results are, therefore, not rustworthy as those obtained on the other and larger areas.

n plots 6, 200 lbs. of ammonia-salts (equal parts sulphate muriate) were used with the mineral manure, and the mixture e an average annual produce of $28\frac{1}{4}$ bushels of dressed corn, 3012 lbs. = nearly 27 cwts. of straw, or an increase over the duce by the mixed mineral manure alone of $9\frac{7}{8}$ bushels of corn, 1115 lbs. = nearly 10 cwts. of straw, which is much more for iven amount of ammonia than was obtained on plots 21 and 22, re the smaller amounts of ammonia-salts were employed.

On plots 7, the amount of ammonia-salts was again doul 400 lbs. being now used. The average annual produce amo to 36⅝ bushels of dressed corn, and to 4212 lbs. = about 37½ of straw; and the increase over the produce with the m mineral manure alone was very nearly 18 bushels of dressed and 2315 lbs. = about 20½ cwts. of straw.

The proportion of increase for a given amount of amm salts was in corn not quite so great, but in straw rather when 400 than when only 200 lbs. of ammonia-salts were But 400 lbs. is a very heavy dressing; and although it under favourable circumstances, give proportionally as increase as a smaller amount, it is doubtless more than i case of the soil in question, or indeed of most soils, is calc to give on the average of seasons, a maximum result for a amount of ammonia employed.

Still, even with 600 lbs. of ammonia-salts (plots 8) ther a further increment, and with 800 lbs. (plots 16) still a fi increment of increase; though at a much diminishing rate given amount of ammonia the greater the quantity empl and the diminution was the greater in the corn than in the

Thus, by the addition to the mixed mineral manure of 20 of ammonia-salts there were obtained 9⅞, by 400 lbs. near by 600 lbs. little more than 19½, and by 800 lbs. little mor 20 bushels increase of corn; and of increase of straw the obtained by 200 lbs. of ammonia-salts 1115 lbs., by 40 2315 lbs., by 600 lbs. 2818 lbs., and by 800 lbs. 3255 lbs. hibited from a more striking point of view, the result i each successive increment of 200 lbs. of ammonia-salts increased produce as under:—

		Corn.		Straw.		
		Bush.	pks.	lbs.		
1st increment (200 lbs. applied)	gave	9	3½	and 1115		
2nd increment (400 lbs. applied)	„	8	0¼	„ 1200	more than	2
3rd increment (600 lbs. applied)	„	1	2¼	„ 503	„	4
4th increment (800 lbs. applied)	„	0	2	„ 437	„	6

It is seen that any additional produce yielded by the more than 400 lbs. of ammonia-salts per acre, was obtai the cost of very much more ammonia for a given amo increase. Moreover, as an inspection of Table XXX. will the weight per bushel of dressed corn was less, and the prop of corn to 100 of straw very much less, under the influe the excessive amounts of ammonia-salts.

Before leaving this series of experiments, attention sho called to the fact, that where 400 lbs., and upwards, of amn salts were used in conjunction with the mixed mineral m the produce, both corn and straw, exceeded that by far

.nure, with all its supply of silica, and organic matter yielding ·bon, both of which were entirely absent in the artificial .nures. To this point further reference will be made.

'erage Annual Produce by 400 lbs. of Ammonia-Salts per Acre, alone, in alternation with the Mixed Mineral Manure, and in combination with different descriptions of Mineral Manure.

Throughout the preceding series the same mixed mineral ınure was always used, but in conjunction with varying amounts ammonia-salts. In the series now to be considered, a fixed antity of ammonia-salts (400 lbs. per acre per annum) was ıployed throughout, but under varying conditions as to the pply of mineral constituents.

The results of this series which stand first in order in the Table, ›se of plots 17 and 18, where the ammonia-salts were used in ternation with the mixed mineral manure, have been so fully scussed in Section II. (pp. 457-8 and 466-7) that it is only cessary here to recall attention to the fact, that under these con- tions the 400 lbs. of ammonia-salts gave an average annual in- ease of scarcely 14¼ bushels of dressed corn, and only 1858 lbs. 16½ cwts. of straw, more than the mineral manure alone; whilst e same amount of ammonia-salts, used in conjunction with the ineral manure, as on plots 7, gave an increase of nearly 18 shels of dressed corn, and 2315 lbs. = 20¾ cwts. of straw.

It has also already been shown how much less was the effect of 0 lbs. of ammonia-salts when used for 19 years without mineral ınure, as on plot 10*a*, or for 13 years only, as on plot 10*b*, ın when they were used in conjunction, or even in immediate ernation, with the mixed mineral manure.

The results next in order, those of plots 11, 12, 13, and 14, ›w in an interesting manner the more or less diminished effect ıen the mineral manure was less complete than the so-called nixed mineral manure" employed on plots 17, 18 and 7, and :asionally on plot 10*b*.

During the first 8 years of the 20, that is, during the 8 imme- ıtely preceding the 12 the average produce of which is now der consideration, plots 11, 12, 13, and 14, all received in ınure from 2½ to 3 times as much phosphoric acid as was taken in the crops, and all much about the same excess. Of potass, four plots yielded much about the same amount in their ›duce; but whilst plot 11 received no direct supply in manure ıly a small quantity in rapecake), plots 12, 13, and 14, each :eived from two to three times as much as was removed from ›m; the accumulation being somewhat the greatest on plot 13. During the last 12 years, in addition to the 400 lbs. of am- ›nia-salts per acre per annum, plots 11 have had superphosphate

of lime, plots 12 superphosphate of lime and sulphate of sod plots 13 superphosphate of lime and sulphate of potass, an plots 14 superphosphate of lime and sulphate of magnesia. Tl object of this arrangement was to trace, by the exclusion certain constituents, the point at which they, respectively, b came deficient.

Up to the present time there is scarcely an appreciable differen in the amounts of produce on plots 12 with soda to the exclusion potass and magnesia, on plots 13 with potass to the exclusi of soda and magnesia, and on plots 14 with magnesia to t exclusion of potass and soda. It is obvious, therefore, that eith the available natural, or the previous artificial, supplies of t respective bases within the soil, have so far prevented relati deficiency of either.

When, however, the produce of these three plots is co pared with that of plots 7, manured each year with the sar amounts of ammonia-salts and superphosphate of lime, and, addition, a mixture of the sulphates of potass, soda, and ma nesia, instead of only one of them, it is found that they gi annually from 1 to 2 bushels less corn, and from 200 to 300 ll less straw. It would appear, therefore, that even though the might be neither an actual nor a relative deficiency of either the bases where only one was supplied, the state of combinatio and the distribution within the soil, were the more favourable, a consequently the supply was the more easily available, when a were supplied together.

There is here, again, evidence of the fact already frequent illustrated, that a direct supply of a given amount of manure h frequently more effect upon the immediate crop, than an equal even much greater quantity accumulated and distributed with the soil in the condition of unexhausted residue from previo manuring.

On plots 11, to which neither potass, soda, nor magnesia h been applied, excepting in small quantity in rapecake in tl earlier years, the average annual produce over the last 12 yea was more than 5 bushels of dressed corn, and more than 700 ll of straw less than on either plots 12, 13, or 14 with either pota soda, or magnesia, and it was nearly 7 bushels of corn and near 1000 lbs. of straw less than on plot 7, where all three were er ployed in addition to the manures of plot 11.

It is clear that the point of relative deficiency of one more of the bases had here been reached; and judging from tl composition of the ash of the produce of this plot (11) co pared with that of plots 12, 13, and 14, it would appear that is of available potass that the plot has become the most deficie The crop has generally appeared pretty healthy and luxuria

during the earlier stages of growth, but of late years the bulk has perceptibly declined, and the proportion of blighted ears has increased in a remarkable degree. Still, the average proportion of corn to straw is higher than in any case with equal or higher amounts of total produce per acre grown by artificial manures. It will be remembered that it was on plots 0, 4, and 5, where, as on these plots 11, phosphoric acid was relatively very abundant, that the highest proportion of corn to straw in the series was obtained. On the other hand, excepting one or two other marked cases of defective manuring, the weight per bushel of the dressed corn of plots 11 was almost the lowest in the series. There was, therefore, with a full average tendency of growth for the production of a fair proportion of corn, at the same time very defective power of maturation.

It has been seen how very ineffective were mineral manures either to bring into activity the unexhausted residue of previous nitrogenous manuring, or to give increase by inducing a greater accumulation of nitrogen by the plant from natural sources; but the results of the series of experiments now under consideration clearly show, how very effective and lasting were the mineral manures employed, to meet the demands made upon the soil for mineral constituents by the use of the nitrogenous manures even in distant succeeding seasons.

Average Annual Produce by Nitrate of Soda, used alone, or with the Mixed Mineral Manure.

During the last 12 years plot 9*b* has been manured with nitrate of soda alone, at the rate of 475 lbs. per acre in the first, and of 550 lbs. in each of the 11 succeeding years. The latter amount was taken as equivalent in nitrogen to the 400 lbs. of ammonia-salts applied in so many of the other experiments; but as of late years nitrate of soda of commerce has been purer than formerly, it was probably slightly more than equivalent in nitrogen to the mixture of 200 lbs. of muriate and 200 lbs. of sulphate of ammonia of commerce. During the preceding 8 years 9*b* was manured with ammonia-salts 7 times, once with rape-cake in addition, in the 1st and 5th seasons received superphosphate of lime, and in the 6th was unmanured. It was, in fact, at the commencement of the 12 years, in a condition intermediate between that of plots 10*a* and 10*b* so far as the supply of mineral constituents was concerned; and the effect of the nitrate will be best brought to view by comparing the results with those of these two plots manured with ammonia-salts.

Whilst 400 lbs. of ammonia-salts alone, applied for 19 years on plot 10*a*, and for 13 years on plot 10*b*, gave an average

annual produce over the last 12 years, on the former of $22\frac{5}{8}$ bushels of dressed corn, and 2603 lbs. = $23\frac{1}{4}$ cwts. of straw, and on the latter of $26\frac{7}{8}$ bushels of corn, and 3061 lbs. = about $27\frac{1}{4}$ cwts. of straw, a nearly identical, but perhaps rather higher, amount of nitrogen applied as nitrate of soda during the 12 years only on plot 9*b*, gave $25\frac{7}{8}$ bushels of dressed corn, and 3187 lbs. = nearly $28\frac{1}{2}$ cwts. of straw. The nitrate has, therefore, given rather less corn, but rather more straw than the ammonia-salts on plot 10*b*; and whilst it is probable that the nitrate supplied rather more nitrogen than the ammonia-salts, the mineral condition of plot 10*b* was doubtless more favourable than that of plot 9*b*.

The conditions and the results were, however, sufficiently near in the two cases to indicate that a given amount of nitrogen will probably, in the average of seasons, and under parallel conditions of soil, give very nearly identical results, whether supplied as nitrate of soda or as ammonia-salts. There is, however, little doubt that nitrogen in the condition of the nitrate becomes more rapidly distributed in the soil, and is more rapidly active. Hence its suitability for Spring dressings; and, hence also in a great measure its tendency to favour great luxuriance of stem and leaf, which, under unfavourable conditions of soil and season, leads to the production of an undue proportion of straw.

On plot 9*a*, in the 1st year of the twelve 475 lbs., and in the 2nd and 3rd, 275 lbs. of nitrate of soda alone were applied; but during the last 9 years the same amount as on plot 9*b* (550 lbs.) has been applied, and not alone, but in conjunction with the mixed mineral manure. The results with nitrate of soda and mineral manure on plot 9*a*, compare best with those of ammonia-salts and mineral manure on plot 7; though, taken over the whole 12 years, 9*a* received neither quite so much nitrogen nor so much mineral manure as plot 7. Comparing the results as they stand, the average annual produce with the ammonia-salts and mineral manure was $36\frac{3}{8}$ bushels of dressed corn, and 4212 lbs. = rather over $37\frac{1}{2}$ cwts. of straw, against $34\frac{1}{4}$ bushels of dressed corn, and 4426 lbs. = $39\frac{1}{2}$ cwts. of straw, with the nitrate and the mineral manure; or nearly 2 bushels less corn, but nearly 2 cwts. more straw, equal about 100 lbs. more total produce, with the nitrate than with the ammonia-salts.

Here again, then, when used in conjunction with a mineral manure supplying liberally every constituent likely to be needed except silica, as well as when used alone, the nitrate indicated a tendency to produce more straw and less corn than the ammonia-salts. Indeed, the crops growing on the nitrated plots always showed to the eye during growth, more stem, and broader leaves than those grown under otherwise parallel conditions with ammonia-salts.

Average Annual Produce on Plots 15*a*, 15*b*, *and* 19.

Several incidental points were sought to be determined by this series.

During the whole 12 years, and for several years previously, each plot received, respectively, the same manure year after year. All had the same amount of bone-ash as in the so-called mixed mineral manure, but acted upon by hydrochloric instead of sulphuric acid. Plots 15*a*, and 15*b*, had also the same amounts of sulphates of potass, soda, and magnesia as in the mixed mineral manure, but plot 19 had none of these. Further, 15*a* had also annually 400 lbs. of sulphate of ammonia, and plots 15*b* and 19, 300 lbs. sulphate of ammonia and 500 lbs. rapecake.

The object of substituting 400 lbs. of sulphate of ammonia, as on plot 15*a*, by 300 lbs. of sulphate of ammonia and 500 lbs. of rapecake on 15*b* and 19, was to supply nearly the same amount of nitrogen in the three cases, with in the two latter a certain amount of organic matter in addition, yielding by decomposition carbon in an available form to the plant. The amount of rapecake used would, in fact, contain rather more nitrogen than the sulphate of ammonia it substituted; but, owing to the comparatively slow action of the rapecake, there would probably be not more annually available until after some years of accumulation. The rapecake would, of course, also supply a certain amount of mineral constituents. Upon the whole, then, it might be expected that, independently of its superiority or otherwise as supplying carbon-yielding matter, the 500 lbs. of rapecake used year after year would be somewhat more effective than the 100 lbs. sulphate of ammonia which it substituted.

The effects of these several combinations will be best tested by comparing the results with those of plots 7. The only material difference between the manuring of the latter and that of 15*a* was, that in the manure of 15*a* the bone-ash was acted upon by hydrochloric acid instead of sulphuric acid, and there was about 8 per cent. or about one-twelfth less ammonia. The result was an average of rather more than 3 bushels of dressed corn, and of 417 lbs. = about 3¾ cwts. of straw, less than on plots 7. About one-half of this deficiency may be attributed to the less amount of ammonia supplied, the remainder only being due to the less effective condition of the bone-ash acted upon by hydrochloric instead of sulphuric acid.

Plot 15*b*, manured exactly as 15*a*, excepting that 100 lbs. of the sulphate of ammonia was replaced by 500 lbs. of rapecake, gave more nearly the amount of produce of plots 7, yielding 1¾ bushel of dressed corn, and rather more than 2 cwts. of straw, more than 15*a*, though still 1½ bushel of corn and 184 lbs. of

straw less than plots 7. There is no evidence, therefore, of any marked effect from the carbonaceous organic matter of the rape-cake.

Plot 19 was manured during the 12 years in the same way as 15*b*, with the exception that the sulphates of potass, soda, and magnesia, were omitted. It should be further observed, that whilst during the first 8 years of the 20, plot 15*a* received of potass in manure, nearly, and 15*b* over, 400 lbs. more, plot 19 received nearly 200 lbs. less, than was removed in the crops. There was, therefore, a considerable relative deficiency of potass in the soil of plot 19, and it gave an annual average produce of nearly 3¼ bushels of dressed corn, and about 4½ cwts. of straw, less than plot 15*b*.

It is worthy of remark that the produce of plot 19, like that of plots 11, where also the supply of phosphoric acid was relatively large, showed a comparatively high proportion of corn to straw, notwithstanding the deficient amount of total produce due to the relative exhaustion of potass in both cases. It may also be mentioned, that the straw has frequently been observed to be finer, the grain more thin-skinned, and the crop more evenly ripened, where the bone-ash has been acted upon by hydrochloric instead of sulphuric acid.

From the results of this series it may be concluded—that there is no practical or economical advantage in rendering bone-ash soluble by the expensive hydrochloric instead of the cheaper sulphuric acid; that rape-cake benefits the wheat crop by its supply of nitrogen and of mineral constituents, but immaterially by the supply of available carbon within the soil from decomposing organic matter; and that where a liberal phosphatic and nitrogenous manure was used for many years, the available supply of potass to the growing crop became very injuriously diminished.

Summary Statement of the Results of the last 12 *Years.*

1. The average annual produce of wheat per acre, over the last 12 of 20 years of the growth of the crop on the same land, and of more than 20 since the application of manure of any kind, was 15½ bushels of dressed corn, and there was no material diminution in the yield in the later years: the proportion of corn to straw was as high as in the produce by farmyard manure, and higher than in the majority of cases with the more productive artificial manures, but the weight per bushel of dressed corn was very low.

2. Farmyard manure, applied every year in amount containing considerably more of every constituent than was removed in the crop, increased the average annual produce to nearly 35¼ bushels

of dressed corn, or by about 20 bushels per acre per annum, and gave the highest weight per bushel of dressed corn in the series, but the proportion of corn to straw was no higher than in the unmanured produce. The annual produce was very much higher during the latter than during the earlier half of the 20 years, but it increased much less rapidly during the last few years.

The questions arise—In what constituent, or class of constituents, was the unmanured land deficient? and—to what constituent, or class of constituents, supplied by the farmyard manure, was its increase of produce due?

3. A complex mineral manure (plot 5), supplying annually more of potass, soda, magnesia, lime, sulphuric acid, and phosphoric acid, than was taken off in the crops (but no silica), even though used after several years of accumulation of unexhausted residue from previous ammoniacal (and mineral) manuring, gave annually only about 3 bushels increase over the unmanured produce, and nearly 17 bushels less than the produce by farmyard manure. The proportion of corn to straw was, however, higher, but the weight per bushel of dressed corn lower, than in the produce by the farmyard manure.

4. Ammonia-salts alone (plot 10*a*), employed for 19 consecutive years after an application of mineral manure supplying of potass about as much as would be removed in the first 3, and of phosphoric acid about as much as would be removed in the first 5 of the 20 years, gave a considerable, but gradually diminishing, average annual increase (over the produce without manure)—amounting over the first 9 years to rather more than 9 bushels, over the last 10 to 7¼ bushels, and over the 12 to which our summary more particularly refers, to rather more than 7 bushels.

5. As ammonia-salts alone increased the produce very much more than mineral manure alone, and did so for a long series of years, it is obvious that the practically exhausted land contained a considerable excess of available mineral constituents relatively to the available supply of nitrogen from soil and atmosphere. The results further show, that the plants growing under the influence of a liberal artificial supply of mineral constituents appropriated scarcely any more nitrogen from natural sources than those growing on the unmanured land.

6. The same mineral manure which alone gave scarcely any increase, and the same amount of ammonia-salts (400 lbs.) which alone gave so much less increase than the farmyard manure, and in a diminishing rate from year to year, gave when employed together an average annual increase of about 21 bushels of corn and 22¾ cwts. of straw over the unmanured produce, or about 1 bushel of corn and 3 cwts. of straw over that by the farmyard manure. Larger additions of ammonia-salts to

the mineral manure gave larger amounts of increase, but at a very much diminished rate in proportion to the ammonia employed. Thus, a manure containing ammonia-salts and soluble mineral constituents, but neither silica nor organic matter yielding carbonic acid or other compounds of carbon within the soil, gave, for many consecutive years, more produce than an amount of farmyard manure supplying annually more of every mineral constituent, including silica, more nitrogen, and more carbon, than the total produce removed from the land.

7. Nitrate of soda, in amount containing about the same quantity of nitrogen as 400 lbs. of ammonia-salts, used in conjunction with the same mineral manure, gave nearly as much corn, and more straw and total produce, than the farmyard manure.

8. No beneficial effect resulted from the use as manure of organic matter yielding by decomposition carbonic acid, or other compounds of carbon, within the soil. In fact, although a crop of wheat equal to the average produce by farmyard manure would contain about 2000 lbs. of carbon, the plant seems practically independent of any supply of carbon by manure, being able to assimilate this large amount, either by its roots or its leaves, from the atmospheric sources, if only mineral constituents and nitrogen be supplied to the soil in sufficient quantity and in available form. Other cultivated plants of the Graminaceous family, such as barley, and the grasses of our meadows and pastures, appear to be equally independent of a supply of carbon by manure. Root-crops, and probably some other of our agricultural plants are, on the contrary, very dependent on a supply of carbon from decomposing organic matter within the soil.

9. The carbonaceous organic matter of the farmyard manure used in the experiments, if not without effect, was obviously at any rate unnecessary; and the increase obtained by the use of that manure was no doubt mainly due to its large, but comparatively slowly available, supply of ammonia, or nitrogen in some other form, and mineral constituents.

IV. Amount of Increased Produce obtained for a given Amount of Ammonia supplied in Manure.

It has been shown that full crops of wheat cannot be grown unless there be a liberal available supply of mineral constituents within the reach of the plant, and further, that such supply is ineffective unless ammonia, or nitrogen in some other available form, be also liberally provided within the soil. In our concluding observations reference will be made to the various means at the farmer's command of keeping up the necessary supplies of both the mineral constituents and nitrogen. But as the purchase

of ammoniacal manures and nitrates constitutes one of the recognised sources of nitrogen for the growth of wheat, the practical question arises—how much increase may be calculated upon from the use as manure of a given amount of ammonia, or of an equivalent amount of nitrogen in some other available form? Table XXXI. (see following page), brings together a vast amount of evidence on this point. It shows the amount of ammonia in manure (or of nitrogen as nitrate reckoned as ammonia) that was required for the production of 1 bushel (or 60 lbs.) increase of wheat grain, with its proportion of straw, on the most important plots, in each of the last 12 years of the experiments.

As the productive effect of a given amount of ammonia depends very much upon the available supply of the necessary mineral constituents within the soil, and as artificial nitrogenous manures of course should not be, and seldom are in practice, employed if the supply of them be deficient, the Table is arranged to show, not the amount of ammonia required for each bushel obtained beyond the produce without manure, but over that by the mixed mineral manure, which being higher, leaves so much the less to be reckoned as increase due to the action of the ammonia supplied. Then, again, instead of taking the actual number of bushels of increase of dressed corn each year, which would represent very different amounts according to the varying weight per bushel from year to year, the number of bushels is, in all cases, calculated by dividing the number of lbs. of increase of corn by 60. For the purposes of the Table, therefore, every 60 lbs. of increase over the produce by the mixed mineral manure is supposed to represent 1 bushel.

Many years ago, in papers in this Journal, we stated, as a provisional estimate deduced from the results of the experiments now under consideration so far as they had then proceeded, that the farmer might assume, for practical purposes, that he would, on the average of seasons, get 1 bushel of wheat and its proportion of straw beyond the produce of the soil and season, for each 5 lbs. of ammonia applied as manure for the crop. This estimate was founded upon results obtained where the mineral constituents were not unduly exhausted, and the amounts of ammonia supplied were not excessive; that is, under conditions likely to accord with those most frequently occurring in common practice.

The statement met with much ridicule from Baron Liebig, who said that it was "a mere stroke of fancy." Whether the statement in question, or this condemnation of it, partakes most of "a mere stroke of fancy," may be judged by the record of facts given in this Section.

50 lbs. of ammonia, or its equivalent of nitrogen, would be supplied in rather under 2 cwts. of commercial sulphate, or $1\frac{3}{4}$

(= 60 lbs.) increase of Wheat-grain, and its proportion of Straw according to the ... supply of Mineral Constituents within the soil, and to the Season.

Plots.	Manures per Acre, per Annum, for 12 Years, 1852–63. (For further particulars, see Appendix, Table IX., and Notes, pp. 162–3; and for Manures previous to 1852, see Appendix—Tables I–VIII., pp. 146–160).	First 6 Years. 1852	1853	1854	1855	1856	1857	Second 6 Years. 1858	1859	1860	1861	1862	1863	Average. First 6 Years, 1852–57	Second 6 Years, 1858–63	The 12 Years, 1852–63	Plots.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
6 (a & b)	200 lbs. Ammonia-salts (1), and Mixed Mineral Manure (2)	12·45	7·13	4·57	4·76	5·68	4·15	4·79	5·40	8·65	4·17	4·66	2·42	5·59	4·36	4·86	6 (a & b)
7 (a & b)	400 lbs. Ammonia-salts, and Mixed Mineral Manure	10·42	7·86	4·31	6·25	5·61	4·35	4·69	7·33	8·76	5·19	5·35	2·72	5·86	4·95	5·37	7 (a & b)
8 (a & b)	600 lbs. Ammonia-salts, and Mixed Mineral Manure	14·49	11·47	5·70	10·42	7·23	5·52	6·12	11·82	10·54	7·67	6·64	3·88	8·01	6·80	7·35	8 (a & b)
16 (a & b)	800 lbs. Ammonia-salts, and Mixed Mineral Manure	17·37	13·08	7·03	12·54	9·75	7·06	7·99	16·20	12·59	9·11	10·73	5·07	9·98	9·00	9·47	16 (a & b)
17 (a & b) or 18 (a & b)	400 lbs. Ammonia-salts, in alternation with Mixed Mineral Manure	12·09	..	4·67	..	7·98	..	6·26	..	10·72	..	9·00	..	6·92	6·47	6·69	17 (a & b) or 18 (a & b)
		..	10·26	..	6·01	..	5·53	..	8·55	..	5·58	..	3·49				
10 (a)	400 lbs. Ammonia-salts alone (19 years, 1845–63)	22·47	138·89	9·15	44·44	20·12	16·69	25·84	..	..	..	17·30	4·02	20·53	22·74	21·07	10 (a)
10 (b)	400 lbs. Ammonia-salts alone (13 years, 1851–63)	20·70	20·20	6·12	9·16	11·53	8·20	10·56	26·67	42·55	..	12·24	3·83	10·39	12·16	11·20	10 (b)
11 (a & b)	400 lbs. Ammonia-salts, and Superphosphate of Lime (3)	16·14	13·55	4·80	56·99	7·84	6·30	7·26	15·60	16·28	13·54	9·65	3·47	8·92	8·25	8·57	11 (a & b)
12 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Soda	13·50	8·25	4·29	6·73	6·79	4·70	4·98	7·40	8·65	5·96	6·33	2·73	6·30	5·24	5·76	12 (a & b)
13 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Potass	14·11	7·81	4·51	7·00	7·36	4·74	5·07	7·63	8·98	5·14	6·86	2·78	6·58	5·27	5·85	13 (a & b)
14 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Magnesia	18·90	8·16	4·45	6·71	6·18	4·70	4·92	7·61	9·18	5·51	7·20	2·73	6·31	5·31	5·77	14 (a & b)
9 (a)	550 lbs. Nitrate of Soda, and Mixed Mineral Manure (4)	9·63	32·68	3·33	7·67	7·39	4·59	5·10	11·30	6·39	5·47	3·80	2·02	6·50	4·73	5·41	(9 a)
9 (b)	550 lbs. Nitrate of Soda alone (5)	11·36	120·48	6·49	13·19	12·71	7·91	22·63	43·86	25·45	..	11·20	4·19	11·20	14·73	12·60	9 (b)

(1) "Ammonia-salts"—equal parts Sulphate and Muriate of Ammonia of commerce.
(2) "Mixed Mineral Manure"—Superphosphate of Lime, and Sulphates of Soda, Potass, and Magnesia.
(3) "Superphosphate of Lime,"—4 parts Bone-ash, and 3 parts Sulphuric Acid, Sp. gr. 1·7.
(4) The Mixed Mineral Manure not applied until 1854–5, and only 475 lbs. Nitrate of Soda for 1852, and 275 lbs. for 1853 and 1854.
(5) Only 475 lbs. of Nitrate of Soda for 1852.

cwts. of commercial muriate of ammonia, in about $2\frac{3}{4}$ cwts. of genuine Peruvian guano, or in rather more than $2\frac{1}{4}$ cwts. of nitrate of soda. These amounts are more than are usually employed in common practice for the wheat crop; and most practical men would consider double these quantities to be very heavy, if not excessive dressings.

In bringing to bear upon the question under consideration the additional experimental evidence now at command, we shall assume, therefore, that the results obtained by the use, per acre, of 50 or 100 lbs. of ammonia (or their equivalent of nitrogen as nitrate) most nearly represent those which may be expected in ordinary practice; and further, that the results obtained by these amounts in the cases where the mineral constituents (unless silica) are not in relative defect, are also such as are most likely to be obtained in ordinary farm practice. Accordingly, we adopt for our purpose, the results obtained on plots 6 with 200 lbs., and on plots 7 with 400 lbs. of ammonia-salts (containing, respectively, 50 and 100 lbs. of ammonia) in each case used in conjunction with the mixed mineral manure; and these will be taken as the standards by which to compare the effects of larger amounts of ammonia with the same mineral manure, or the same amounts of ammonia under less favourable conditions as to the supply of mineral constituents.

It will be observed, that, almost uniformly, rather less ammonia was required to produce 60 lbs. increase of corn on the average of the last 6, as compared with the first 6 of the last 12 years. It will, perhaps, be said that the apparently better effect during the later years is in reality due to the unexhausted residue of the supplies in the earlier years. Evidence enough has been adduced showing the limit of the effect of such unexhausted residue; and, whilst admitting that a portion of the difference in favour of the later years may be attributed to previous accumulation, there can be no doubt, as has been shown, that the last 6 seasons were themselves more favourable than the preceding 6, and that to this cause a considerable portion of the difference is really due. Subject, then, to some correction on the score of accumulation, the average result over the 12 years may doubtless be taken as pretty closely representing the average effect of a given amount of ammonia, according to the amount of it employed, and to the favourable or unfavourable condition of the soil in regard to the supply of mineral constituents.

When 50 lbs. of ammonia per acre were annually applied in conjunction with a complex mineral manure, excluding silica (plot 6), the average annual result was, that 4·86 lbs. of ammonia were required to produce 60 lbs. increase of corn, with its equivalent of straw. This amount of ammonia, as has been said,

TABLE XXI.—Quantity of Ammonia in Manure (or of Nitrogen as Nitrate reckoned as Ammonia) required to produce 1 bushel (= 60 lbs.) increase of Wheat-grain, and its proportion of Straw, according to the quantity applied per Acre, to the available supply of Mineral Constituents within the soil, and to the Season.

Plots.	Manures per Acre, per Annum, for 12 Years, 1852–63. (For further particulars see Appendix, Table IX., and Notes, pp. 162–3; and for Manures previous to 1852, see Appendix—Tables I–VIII., pp. 146–160).	First 6 Years.						Second 6 Years.						Average.			Plots.
		1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	First 6 Years, 1852–57	Second 6 Years, 1858–63	The 12 Years, 1852–63	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
6 (a & b)	200 lbs. Ammonia-salts (1), and Mixed Mineral Manure (2)	12·45	7·13	4·57	4·76	5·68	4·15	4·79	5·40	8·85	4·17	4·66	2·42	5·59	4·36	4·86	6 (a & b)
7 (a & b)	400 lbs. Ammonia-salts, and Mixed Mineral Manure	10·42	7·86	4·31	6·25	5·61	4·35	4·68	7·33	8·76	5·19	5·35	2·72	5·86	4·95	5·27	7 (a & b)
8 (a & b)	600 lbs. Ammonia-salts, and Mixed Mineral Manure	14·49	11·47	5·70	10·42	7·23	5·52	6·12	11·82	10·54	7·67	6·64	3·88	8·01	6·80	7·35	8 (a & b)
16 (a & b)	800 lbs. Ammonia-salts, and Mixed Mineral Manure	17·37	13·08	7·63	12·54	9·75	7·06	7·99	16·20	12·59	9·11	10·72	5·07	9·98	9·00	9·47	16 (a & b)
17 (a & b) or	400 lbs. Ammonia-salts, in alternation with Mixed Mineral Manure	12·09	..	4·67	..	7·98	..	6·26	..	10·72	.	9·90	..	6·99	6·47	6·69	17 (a & b) or
18 (a & b)		..	10·26	..	6·01	..	5·55	..	8·55	..	5·88	..	3·49				18 (a & b)
10 (a)	400 lbs. Ammonia-salts alone (19 years, 1845–63)	22·47	138·89	9·15	44·44	20·12	16·89	25·64	..	..	..	17·30	4·62	20·52	22·74	21·57	10 (a)
10 (b)	400 lbs. Ammonia-salts alone (13 years, 1851–63)	20·70	20·20	6·12	9·16	11·53	8·29	10·56	26·67	42·55	..	12·24	3·89	10·39	12·16	11·20	10 (b)
11 (a & b)	400 lbs. Ammonia-salts, and Superphosphate of Lime (3)	16·14	13·55	4·80	56·98	7·84	6·30	7·26	15·60	16·28	13·54	9·85	3·47	8·92	8·25	8·57	11 (a & b)
12 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Soda	13·50	8·25	4·29	6·73	6·79	4·70	4·98	7·40	8·68	5·96	6·33	2·73	6·39	5·24	5·76	12 (a & b)
13 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Potass	14·11	7·81	4·51	7·00	7·36	4·74	5·07	7·63	8·98	5·14	6·56	2·78	6·38	5·27	5·85	13 (a & b)
14 (a & b)	400 lbs. Ammonia-salts, Superphosphate of Lime, and Sulphate of Magnesia	12·90	8·16	4·45	6·71	6·18	4·70	4·93	7·61	9·18	5·54	7·20	2·73	6·31	5·31	5·77	14 (a & b)
9 (a)	550 lbs. Nitrate of Soda, and Mixed Mineral Manure (4)	9·63	32·68	3·33	7·67	7·30	4·59	5·10	11·30	6·39	5·47	3·80	2·62	6·50	4·73	5·41	(9 a)
9 (b)	550 lbs. Nitrate of Soda alone (5)	11·36	120·48	6·49	13·19	12·71	7·91	22·83	43·66	25·45	..	11·30	4·19	11·29	14·73	12·60	9 (b)

(1) "Ammonia-salts"—equal parts Sulphate and Muriate of Ammonia of commerce.
(2) "Mixed Mineral Manure"—Superphosphate of Lime, and Sulphates of Soda, Potass, and Magnesia.
(3) "Superphosphate of Lime,"—4 parts Bone-ash, and 3 parts Sulphuric Acid, Sp. gr. 1·7.
(4) [illegible] ...rate of Soda for 1852, and 275 lbs. for 1853 and 1854.

ommercial muriate of ammonia, in about $2\frac{3}{4}$ cwts. of Peruvian guano, or in rather more than $2\frac{1}{4}$ cwts. of soda. These amounts are more than are usually em- common practice for the wheat crop; and most prac- would consider double these quantities to be very heavy, essive dressings.

aging to bear upon the question under consideration ional experimental evidence now at command, we shall herefore, that the results obtained by the use, per acre, 100 lbs. of ammonia (or their equivalent of nitrogen) most nearly represent those which may be expected in practice; and further, that the results obtained by these in the cases where the mineral constituents (unless silica) relative defect, are also such as are most likely to be ob- ordinary farm practice. Accordingly, we adopt for our the results obtained on plots 6 with 200 lbs., and on ith 400 lbs. of ammonia-salts (containing, respectively, 00 lbs. of ammonia) in each case used in conjunction mixed mineral manure; and these will be taken as rds by which to compare the effects of larger amounts ia with the same mineral manure, or the same amounts ia under less favourable conditions as to the supply of onstituents.

be observed, that, almost uniformly, rather less ammonia red to produce 60 lbs. increase of corn on the average t 6, as compared with the first 6 of the last 12 years. erhaps, be said that the apparently better effect during years is in reality due to the unexhausted residue of the n the earlier years. Evidence enough has been adduced he limit of the effect of such unexhausted residue; and, nitting that a portion of the difference in favour of the 's may be attributed to previous accumulation, there doubt, as has been shown, that the last 6 seasons were s more favourable than the preceding 6, and that to a considerable portion of the difference is really due. hen, to some correction on the score of accumulation, ge result over the 12 years may doubtless be taken as sely representing the average effect of a given amount of according to the amount of it employed, and to the or unfavourable condition of the soil in regard to y of mineral constituents.

50 lbs. of ammonia per acre were annually applied in on with a complex mineral manure, excluding silica he average annual result was, that 4·86 lbs. of ammonia ired to produce 60 lbs. increase of corn, with its equi- straw. This amount of ammonia, as has been said,

is as much, if not more, than would be generally employed; and it is seen that, with it, the quantity expended for each bushel of increase was very nearly the previously assumed amount of 5 lbs. When double the quantity per acre was used, which would be much more than appropriate for most soils and seasons, rather more than 5 lbs. (5·37), when 3 times the amount 7·35 lbs., and when 4 times 9·47 lbs., were required. Thus, when excessive amounts of ammonia are employed, much more is expended for the production of a given amount of immediate increase of crop, than when only moderate quantities are used; and it has been seen how very slowly the excess may become available in after years.

Still more unfavourable was the result when 400 lbs. of ammonia-salts (equal 100 lbs. ammonia) were employed under defective conditions as to the supply of mineral constituents. On plots 17 and 18, on one or the other of which that amount was each year employed succeeding the application of the mixed mineral manure in the preceding year, it required 6·69 lbs. of ammonia to produce 60 lbs. of increase of corn with its proportion of straw. On plots 12, which might be deficient in available supply of magnesia and possibly of potass, on plots 13 which were probably relatively deficient in magnesia, and on plots 14 probably in the later years in potass, the amount of ammonia required was from 5·76 to 5·85 lbs. instead of only 5·37 lbs. on plots 7, where, with the same amount of ammonia-salts, the mineral manure each year supplied all three bases—potass, soda, and magnesia. Then again, on plots 11, to which no direct supply of either potass, soda, or magnesia, had been made throughout the 20 years (only small quantities in rape-cake) 8·57 lbs., on plot 10*b*, with a deficiency almost certainly of potass and phosphoric acid, and probably of magnesia also 11·2 lbs., and on plot 10*a*, with a still greater deficiency of mineral constituents, 21·57 lbs., or more than 4 times the normal amount of ammonia, were required to be provided for the production of 60 lbs. increase of corn, and its proportion of straw.

Very similar results were obtained when nitrogen, about equal in amount to that in 100 lbs. of ammonia, was supplied in the form of nitrate of soda, instead of ammonia-salts. When the nitrate was used year after year with the mixed mineral manure (plot 9*a*), it required nitrogen about equal to that in 5·41 lbs. of ammonia to produce 60 lbs. increase of corn and its proportion of straw, against 5·37 lbs. when ammonia-salts were used (plot 7). But when the same amount of nitrate was used without the mineral manure, an amount of nitrogen averaging about 12·8 lbs. of ammonia was annually expended to produce the same result.

It may be observed, too, that assuming the farmyard manure

to have contained only a moderate proportion of nitrogen, the amount expended for the production of a given quantity of increase corresponded to considerably more ammonia than was required when nitrogen equal to 50, or even 100 lbs., of ammonia was employed as ammonia-salts, or nitrate of soda, in conjunction with the mixed mineral manure, notwithstanding that the latter contained no silica, a constituent so liberally provided in the farmyard manure. It would appear, therefore, that the practical results have not yet been materially affected for want of available silica where the mixed mineral manure was employed. There is, however, evidence in our analytical results that silica has become relatively deficient where it has not been supplied in the manure.

Very striking indeed, then, is the difference of effect upon the immediate increase, of a given amount of nitrogen in manure, whether used as ammonia-salts or nitrate, according to the available supply of mineral constituents within the soil; and with the overwhelming evidence before him, which such a comprehensive summary of experimental results on the point affords, the practical man will not fail to see that he not only very injuriously further reduces his immediately available supply of mineral constituents, but also pays very dearly for his increase, if he seek to obtain it by means of purely nitrogenous manures, when his soil is already unduly exhausted of mineral constituents.

Equally, if not more, striking, is the difference of effect of a given amount of ammonia in one season as compared with another. Where the mineral condition is the most defective, there the result of a given amount of ammonia is the most reduced below the average in a bad season. Leaving the reader to the study of all such abnormal cases in the records given in the Table, it will be sufficient here to direct attention to the great difference of effect according to season even under the more favourable conditions as to the amount of ammonia employed, and as to the associated supply of mineral constituents.

The results of plot 6, where only 50 lbs. of ammonia were applied each year, and always in conjunction with the mixed mineral manure, will well illustrate the point in question. Whilst, taking the average of the 12 years, it required 4·86 lbs. of ammonia in manure to yield 60 lbs. of increase of corn and its proportion of straw, in the remarkably productive season of 1863 it required only 2·42 lbs., but in 1853, 7·13 lbs., in 1860, 8·85 lbs., and in 1852, 12·45 lbs. The amount of produce was, indeed, lower in 1853 than in 1852; but as the deficiency was very much greater with the mineral manure alone (upon the produce of which the increase is calculated) than where the

ammonia-salts were also used, the amount reckoned as increase due to the ammonia was by so much the greater in 1853, and hence the better result for a given amount of ammonia in that year than in 1852.

To conclude on this point: Great as is the difference of effect of a given quantity of ammonia, according to the amount applied per acre, to the mineral condition of the soil, and to the season, still, when only moderate quantities were used, when there was a sufficient supply of mineral constituents, and taking the average of many seasons—that is, under the conditions the most comparable with those of the average of common practice—the result was, in marked accordance with our early estimate, that almost exactly 5 lbs. of ammonia were required to be expended to obtain an increase of 1 bushel of wheat grain, and its proportion of straw.

V. Concluding Observations; showing the Practical Bearings of the Results.

Referring the reader to the fuller summaries already given, of the conclusions arrived at in reference to each separate branch of the subject, it only remains, in bringing this paper to a close, very briefly to recapitulate a few of the most prominent facts elicited, and to show their connexion with, and bearing upon, the ordinary farm practice of this country.

1. On a soil of not more than average wheat-producing quality, and taken for experiment after a course of 5 crops since the application of manure, wheat has been grown successfully, without manure, and with different descriptions of manure, for 20 years in succession.

2. Without manure, the produce of dressed corn was, in the first year, 15 bushels per acre; in the last, $17\frac{1}{4}$ bushels; and, taking the average of the 20 years, $16\frac{1}{4}$ bushels.

3. With farmyard manure, applied every year, the produce was, in the first year, $20\frac{1}{2}$ bushels; in the last, 44 bushels; and on the average of the 20 years, $32\frac{1}{2}$ bushels.

4. With artificial manures, the highest produce was, in the first year, $24\frac{1}{4}$ bushels; in the last, $56\frac{1}{2}$ bushels; and, taking the average of the 20 years, $35\frac{3}{4}$ bushels, or considerably more than the average produce of Great Britain when wheat is grown in the ordinary course of agriculture in rotation; and also considerably more than was obtained in the same field by an annual application of farmyard manure.

5. Mineral manures alone, though applied in the soluble form, increased the produce scarcely at all; that is, they did not enable the plant in any material degree to assimilate more nitrogen and

carbon from atmospheric sources, than when it was grown on the practically exhausted unmanured land.

6. Nitrogenous manures alone, increased the produce very considerably for many years in succession; hence, the soil in its practically exhausted condition was relatively much richer in available mineral constituents, than in available nitrogen.

7. The largest crops were obtained when mineral and nitrogenous manures were employed together; and it was by such mixtures, even though they supplied no silica (nor carbon), that the produce by farmyard manure was far exceeded, although the latter supplied, not only both silica and carbon, but all other constituents in larger quantity than they were removed in the crops.

The question arises—Will any conclusions drawn from these results regarding the character of the exhaustion induced by a course of cropping in this particular soil, and consequently regarding the description of manure required before it will again produce full crops of wheat, be at all applicable to any other soil, or to soils generally?

Baron Liebig, although he profusely illustrates his own views by reference to field experiments, and even to isolated results of our own, if by unfair representation they can be made to serve his purpose, and although it is doubtless by the evidence of such experiments that he has been led to his present, and on many points greatly amended, views, at the same time denies the utility of field experiments generally, and of our own in particular, as a basis of deduction regarding even a neighbouring field, and, still more, a field in any other locality. Other authorities look at field experiments in a very different light. Only a few weeks since, in a lecture delivered before the members of the Highland and Agricultural Society of Scotland, at Stirling, Professor Anderson took as his subject the importance and the best mode of promoting field as well as other experiments in connexion with agriculture.

With regard to the particular soil upon which the experiments which form the subject of this Report were made, Baron Liebig, according to the exigency of his argument, has maintained alternately that it was so rich, and so poor, in mineral constituents, that it was utterly unfit for the purposes of our investigation. To aid the judgment of those who may wish to consider the subject in the spirit of candour proper to an important practical and scientific inquiry, it may be well to indicate how far the results, briefly stated above, are consistent with those obtained in direct experiments in an adjoining field, and on soils of very different descriptions in other localities, and also how far they are consistent with the common experience of practical agriculture in this country.

The following Table (see page 493) shows, side by side, the average annual produce obtained, without manure, by the "mixed mineral manure" alone, by 400 lbs. ammonia-salts alone, and by the "mixed mineral manure" and 400 lbs. ammonia-salts together—

1. During 8 years (1856-63) in the experimental field in which the results recorded in this paper were obtained.

2. During the same 8 years in an adjoining field, after several wheat crops had previously been taken without manure.

3. During 3 years (1852-54) at Holkham, in Norfolk, on a soil described as a light, thin, and rather shallow, brown sand-loam, but resting upon an excellent marl containing a large quantity of calcareous matter, and which had grown wheat in the preceding year with the same manures, and white turnips manured with farmyard dung and guano (of which both tops and roots were removed), in the year preceding the wheat.

4. Over 4 years (1856-59) at Rodmersham, Kent, on a soil described as a mixed clay, upon a chalk subsoil lying from 4 to 6 feet below the surface, and which had grown—in 1853, turnips manured with 2 cwts. of guano and 3 cwts. of superphosphate of lime per acre, the crop being fed on the land; in 1854, barley; and in 1855, beans with stable dung.

The coincidence of the results obtained in the two fields at Rothamsted is most striking; and when the known differences in the condition of the comparable plots in the two cases are taken into consideration, even the differences, such as they are, only afford additional evidence of the consistency of the indications. Thus, in Broadbalk field, the mineral manure alone succeeded heavy dressings of nitrogenous manure, whilst in the other it did not; and, accordingly, there is rather more produce in the former than in the latter. Again, the ammonia-salts had, in Broadbalk field, been used alone for several years on the same plot prior to the period taken into the calculation; and hence, with the greater exhaustion of mineral constituents in its case, there was rather less produce. The results without manure, and with the mixed mineral manure and ammonia-salts together, are so nearly identical in the two cases as to call for no remark.

The Holkham soil and subsoil were totally different in character to those at Rothamsted; the condition at the commencement as affected by recent manuring was rather higher, and two of the seasons over which the averages are taken were unfavourable, and one very favourable for the wheat crop. With these great differences of circumstance in almost every particular, we still find, as at Rothamsted, very little increase by mineral manure alone, considerably more by ammonia-salts alone, and more still by mixed mineral manure and ammonia-salts together.

The Rodmersham soil and subsoil were more nearly allied in

XXII.—Results of Experiments on the GROWTH of WHEAT by t Manures, on different Soils, in different Localities, and in different s.

	Average Annual Results.			
	Rothamsted, 8 Years; 1854-61.		Holkham, Norfolk; 3 Years, 1852-54.	Rodmersham, Kent; 4 Years, 1856-59.
anures applied each Year.	Broadbalk Field.	Hoos Field.		
Dressed Corn, per Acre; in Bushels and Pecks.				
ed	16 0	15 0	17 3¾	25 2¼
neral Manure, alone	19 0	16 0¼	19 0½	28 2
-salts, alone	23 0¾	26 0½	27 0¾	31 1¾
neral Manure, and Ammonia-salts	38 1¾	37 1½	32 2½	33 2
Weight per Bushel of Dressed Corn; lbs.				
ed	57·0	57·7	61·3	59·4
ineral Manure, alone	58·4	58·5	62·1	60·1
-salts, alone	56·0	56·9	59·6	58·5
neral Manure, and Ammonia-salts	58·9	58·0	62·4	57·8
Total Corn, per Acre; lbs.				
ed	990	926	1111	1565
ineral Manure, alone	1192	987	1202	1760
-salts, alone	1471	1618	1636	1917
neral Manure, and Ammonia-salts	2407	2295	2055	2020
Straw (and Chaff), per Acre; lbs.				
ed	1625	1459	1298	3343
ineral Manure, alone	1804	1528	1700	3949
-salts, alone	2536	2705	2240	4788
neral Manure, and Ammonia-salts	4176	4016	2838	5696

er to those of Rothamsted; but the condition as affected nt manuring was very much higher. In fact, the land, om being at the commencement in a practically exhausted on requiring liberal manuring, was described as being in a well cultivated and fertile state, and prepared for the rop. The quantities of ammonia actually applied were, e, obviously very excessive. The result, under these cir- ices, was, as might be expected, much higher produce

without manure, and smaller amounts of increase, especially of corn, with the nitrogenous manures. Still, the general character of the average results over the four years, is the same as in the other cases. There is but a small amount of increase by the mixed mineral manure alone, much more by ammonia-salts alone, and more still by the mixed mineral manure and ammonia-salts together.

But, independently of the evidence of direct experiment, such as is afforded in the results above referred to, we would here reiterate the opinion given in substance in former papers, and founded on a very extensive acquaintance with the practical experience of farmers in the use of artificial manures in every district of Great Britain for many years past, that, in 99 cases out of 100 in which wheat grown in the ordinary course of agriculture requires further manuring, it would be much more increased by the application of nitrogenous than of purely mineral manures; in other words, that in the ordinary course of agriculture with rotation, as practised in this country, the supply of mineral constituents immediately available for the wheat crop, is almost invariably in excess relatively to the immediately available supply of nitrogen from the atmosphere, or the accumulated stores within the soil itself. Furthermore, with few exceptions, the worse the so-called "condition" of the land, that is, the more it is in the agricultural sense exhausted, the more striking would be the effect of exclusively nitrogenous compared with that of exclusively mineral manures.

What, then, are the common practices of British agriculture which lead to this result?

Let us take as an example, as we have done before, the practice of the so-called four course rotation—of roots, barley, clover (or beans), and wheat. Let us further assume, for the sake of argument, that on the average 30 bushels of wheat, 35 bushels of barley, and the meat from the consumption of 10 tons of swedes and clover equal to 6000 lbs. of clover hay (or 1500 lbs. of be[illegible] corn), are the products sold from each acre of the farm in the [illegible] years, and that the straw of the corn crops, and the excreme[illegible] from the animals feeding on the roots and the clover or bea[illegible] are retained on the farm as manure, and returned periodica[illegible] to the land. Confining attention, for the sake of simplicity [illegible] illustration, to those mineral constituents which, so far as exi[illegible] ing knowledge goes, are the most likely to become relativ[illegible] deficient in the majority of soils, it may be estimated that, un[illegible] [illegible] course, the average annual loss per acre by the sale [illegible] meat, would be of potass from $4\frac{1}{2}$ to 5 lbs., of ph[illegible] [illegible] acid from [illegible] to 8 lbs., and of silica about 3 lbs.

ut all practical men will admit that the amounts of produce
assumed to be exported from each acre, or equivalent
unts in other forms, could only be so under one of two con-
ons. Either the soil must be naturally a very fertile one, or
produce must be kept up by means of purchased cattle-food
rtificial manures. In the case of a soil so fertile as to have
ded for any considerable number of years the average produce
posed without assistance from import, it may well be ques-
ed whether it, with its workable subsoil, would not be com-
nt to yield annually, by decomposition, the necessary amounts
he mineral constituents mentioned, and if of them of others
, for an all but indefinite period. In the other case—that in
ch the produce is kept up by means of the import of cattle-
l or artificial manure, or of part one and part the other—the
of the constituents in question derived from the soil itself
, of course, be by so much less than the amounts assumed
ve, and that of others will be also reduced. There can indeed
ittle doubt that, in actual practice, the loss to the soil itself,
the sale of corn and meat, is generally more nearly one-half,
frequently less than one-half, of the above assumed amounts
he constituents mentioned; and that of others will be less
ordingly.

o far as the purchase of food for stock was relied upon, no
ction could well be made from the current supplies in the
ket, that would not bring upon the farm more of the mineral
stituents than the increase of produce due to the manure
ined from it would remove from the land in the form of corn
meat. In fact, to increase the sales of corn and meat by the
ort of cattle-food as generally practised, is to increase, and
to diminish, the amount of available mineral constituents
hin the soil. If, on the other hand, the produce were kept up
means of artificial manures, the rules of selection among intel-
ent practical men are such, that almost invariably much more
hosphoric acid at any rate, would be brought upon the land,
n would be removed from it in the increase of corn and meat
to the use of the imported manures.

n the case supposed without import, it is probable that, in the
jority of instances, phosphoric acid would be the most liable to
ome deficient in relation to other constituents. The sources
phosphoric acid developed in recent years, promise, however,
answer to any demand that seems likely to be made upon them
remedy such exhaustion of it as the present agricultural prac-
s of the country induce.

n the case of imports, on the other hand, especially where
consisted chiefly of the current artificial manures rather than

of cattle-foods, potass would be the most likely to becor
cient. The sources of potass in the market are, indeed, nc
and its price is high. Still, it would be a very ecoı
manure if it increased the immediate produce by an amoı
taining anything like the proportion of that supplied, w
obtained in the case of nitrogen when nitrogenous manı
employed. But current practices have certainly not ye
reduced the relative supply of potass in our soils as tc
the application of direct potass-manures to the wheat
all profitable to the farmer. The results detailed
paper clearly show, however, that salts of potass are
enough on the growth of wheat when the immediatel
able supply within the soil is really unduly exhausted re
to that of other mineral constituents, provided only th
be no deficiency of available nitrogen. In the case o
minous crops, indeed, potass-manures will frequently
increase the amount of nitrogen assimilated over a giv
without any direct supply of the latter by manure. And
it happen that our modern system of town drainage sho
to such an exhaustion of our arable lands of their due
tion of available potass, that potass-manures from withou
become really effective, there can be little doubt that a s
economical source of supply would soon supervene on
demand.

There is, of course, no question, that if the manurial
tuents resulting from the consumption of the corn and m
into our towns could be returned to the land whence the
its produce would be considerably increased; for w
mineral constituents there would always be associated n
in amount which would serve to render effective a cons
portion of all, if not the whole of some, of those constitue
however, human excretal matters continue to be dilut
water to the extent recognised by the growing system c
lefecation, and if dilute liquid sewage cannot be distrit
small quantities over large areas at a much lower cos
armer than has yet been proposed, there is little hope
manurial constituents derived from the human food sent
owns can be re-distributed over the area from which the
Indeed, having regard to the inapplicability of dilute
sewage to arable land, except in small quantities and at
seasons, and to the assumed cost of distribution, it
robable that the most profitable mode of utilisation of
ill be, to limit the area by applying the greater part, if
hole, to permanent or other grasses, laid down to take it
und, trusting mainly to the periodically broken up rye-gr

and to the application to arable land of the solid manure resulting from the consumption of the sewaged grass, for obtaining other produce than milk and meat by means of sewage.

In the illustrations given above, therefore, it is sought to convey an approximate idea, on the one hand of the utmost extent, and on the other of the probable limit, of the loss to which our arable soils are subject by the sale of corn and meat, supposing the mineral constituents be not returned to the land whence they came. Confining attention to this object, we necessarily leave out of view the cases in which roots, hay, or straw, are largely sold, for, in such, compensation is generally made by the return to the land of town manures of some kind. If this be not done the loss of mineral constituents will, of course, be very considerable.

In view of the facts above adduced, we think it may safely be concluded, that the modern practices of this country, taken as a whole, do not tend to the injurious exhaustion of the mineral constituents in anything like the degree that has been assumed by some. Further than this, we think the evidence is more in favour of the supposition that, in a great majority of our soils, they are, by the combined aid of progressive liberation, and of restoration from without, becoming, in the course of cultivation, richer rather than poorer in immediately available mineral constituents relatively to immediately available nitrogen. So far as this is attained at the expense of the constituents of the soil itself, there is, of course, the less to fall back upon within a given depth from the surface. But, it surely cannot be denied, that if there really is an annual liberation of mineral constituents in available form for the growth of plants, at least a portion of this may, with propriety, be sold off the farm for good and all.

The exact amount of annual loss of mineral constituents which any soil, with its workable subsoil, can permanently support without injury, cannot, indeed, be proved. But such evidence as is at command goes to show, that, under the conditions at present existing, the nature and extent of the loss to which our soils are subject are such, that the majority are deficient of available nitrogen rather than of available mineral constituents, so far as the requirements for full crops of the cereal grains are concerned.

Insisting strongly, then, as we have always done, upon the absolute necessity of a full supply of available mineral constituents within the soil, relatively to that of nitrogen, we still believe that, in the actually existing conditions of British agriculture, it is not they, but the available nitrogen, that is generally found to be relatively deficient.

What then, are the sources of available nitrogen within the

soil, to which the farmer must look for the production of good crops of wheat?

In former papers in this Journal, we have pointed out that his chief means to this end was the adoption of a suitable rotation of crops—alternating with his corn the so-called "green," "fallow," or "fodder" crops, an important office of which it is to collect from natural sources, or to conserve on the farm in the form of manure, available nitrogen for the increased growth of the saleable cereal grains. We have further maintained that, as either by bare fallow, or a rotation of crops, with the consumption of the fallow crops and the retention of the straw on the farm, the accumulation of available mineral constituents will generally be in excess of the available nitrogen, it is the amount of the latter, rather than of the former, that will be the measure of the increased produce obtained by such means.

Baron Liebig's former views of the means by which our cereal crops were to be increased were, however, directly opposed to those here stated. He assumed that fertility was quite independent of the ammonia conveyed to the soil; that if only the necessary mineral constituents were supplied in sufficient quantity and in available form, our cultivated plants, Graminaceous as well as Leguminous, would derive sufficient ammonia from the atmosphere; that the presence of ammonia in our manures was immaterial; indeed, that the entire future prospects of agriculture depended upon our being able to dispense with ammonia in our manures, therefore with animal manures, and hence with the bulky farmyard manure, and substitute for it artificial preparations.

Baron Liebig now fully admitting the inefficacy of the wheat-manure devised by himself, attributes its failure to the condition of insolubility in which the mineral constituents were provided in it; and having formerly treated the investigations of Professor Way on the properties of soils with much ridicule, he now passes a well merited eulogium on the important experiments and discoveries of that gentleman and Mr. H. S. Thompson, and alleges, that since it has been shown that certain soluble mineral substances become sufficiently insoluble when supplied to the soil, the want of the anticipated effect of his manures is completely explained. It is obvious, however, that those discoveries afford no explanation whatever of that failure; for if insolubility were the only bar to efficiency, the same constituents supplied in the soluble form should have the effect which Liebig's wheat manure was designed to produce. They should, in fact, enable the wheat-plant to assimilate sufficient nitrogen from the atmosphere for large crops. But the results of direct experiment recorded in this and former papers, as well as the common experience of this country show, that those soluble mineral manures which are effective enough

when available nitrogen is supplied within the soil, are entirely unavailing to yield any more than a very immaterial amount of increase in the absence of such supply.*

Very inconsistently, however, with the supposition that want of solubility was the defect of his mineral manure, Baron Liebig now maintains that progress in agriculture depends, not as before on being able to dispense with a rotation of crops, with nitrogenous manures in general, and with farmyard manure in particular, and to substitute it by artificial preparations, but upon a proper rotation of crops, the successful growth of fodder plants, the use of farmyard manure, and the accumulation of nitrogenous food within the soil, so very important for the perfect growth of the cereals.

Whilst thus adopting the views which we have maintained in opposition to his own for so many years past, and have supported by much experimental and other evidence in the pages of this Journal, he seeks to convey the impression to his readers that we have in reality advocated directly contrary opinions—that, in fact, in insisting upon the necessity of an accumulation of available nitrogen within the soil for the increased growth of the cereals, we assume that the chief source of that accumulation should be ammonia purchased from without. In illustration of the hopelessness of improvement in agriculture under such conditions, he points out how very inadequate are the supplies of nitrogen in the form of purchased manure from without to any largely increased growth of corn; a view in which we need hardly say we fully concur.

No doubt the supply of ammonia, or nitrogen in some other form, from without, limited as it is, is a very important adjunct to that accumulated for the growth of the saleable cereal grains by means of rotation, and its associated practices. But we have

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* Notwithstanding Baron Liebig's former ridicule of Professor Way's experiments, and his subsequent acknowledgment of the importance of his results only after it was generally admitted, and when it was found that they were essential as the basis of new views of his own, and that they served him to explain his previous error (in a manner, however, which is seen to be quite untenable), the following are the terms in which that acknowledgment is spoken of by Professor Hofmann in his capacity of International Reporter:—

"The correction of his error by Way, Liebig frankly and unhesitatingly accepted. His genius instantly appreciated the value of the English chemist's observation; and shed upon it so bright a light as may be said to have doubled its importance. Liebig, in fact, studied the new truth in all its bearings, supplied its most generally received interpretation, displayed its momentous consequences, elevated it to the rank of a law of nature, and embodied this law as one of the corner-stones of his great edifice."

"Probably, in all Liebig's illustrious career, no incident bears higher testimony than this to the vigour and fertility of his intellect, to his undeviating candour, and to his disinterested solicitude, on all occasions, for truth and truth alone." (Report of International Exhibition of 1862, p. 167.)

long ago expressed our conviction that if the supplies of ammonia were much increased, the available mineral constituents of our soils would in their turn become relatively deficient.

It is one thing to maintain, as we do, that under the existing conditions of agriculture in this country, the nitrogen in manures has justly a preponderating value attributed to it, and quite another to advocate as we do not, and never have done, that nitrogenous manures alone should be obtained from without. Nor is it the practice of intelligent farmers so to make use of the nitrogenous manures in the market. Those which the most nearly approach the character of purely nitrogenous manures, such as ammonia-salts and nitrate of soda, are rarely even for a single crop used alone, and never so by any farmer of moderate intelligence, unless—to say nothing of the periodical supplies of the home manures, perhaps enriched by the consumption on the farm of purchased food for stock—he applies specially phosphatic manure to some other crop in his course.

The objection that has been raised against the practice of purchasing food for stock, that that which is a gain of constituents to the purchaser is in the same degree a loss to the seller, surely in these days of growing intelligence, and of extension of commercial freedom and interchange of commodities throughout the world, hardly requires serious consideration. The producers in thickly-populated districts will reap the just reward of their folly if they dispose, without due compensation, of products which the requirements of their own markets, or of their own soils, render it desirable that they should keep at home. But, if countries thi[nly] populated in relation to the area, and to the capabilities of [their] soils and climates with which they have to deal, should not sup[ply] the wants of those more densely peopled, in exchange for su[ch] commodities as they may need and their customers may [be] able to supply, because in so doing they would dispose of a porti[on] of the mineral constituents annually liberated within their soi[l], the sooner this chemical principle of protection is understood a[nd] acted upon, and the sooner the commercial system of the world [is] abandoned, and we make up our minds to be satisfied with th[at] which is produced at our own doors, the better we suppose w[ill] it be. For our own part, we are disposed to entertain some tr[ust] and confidence that the laws of supply and demand, if left un[f]ettered by artificial restrictions, will in this, as in other matte[rs], so regulate production as may best contribute to the wants [of] mankind at large.

Taking, however, the conditions of our agriculture as th[ey] ...lly exist, and not anticipating a revolution in the sense j[ust] supposed, we are disposed to consider that the relation of t[he] ...plie... ...otass and other mineral constituents, to those

phosphoric acid and nitrogen in the market and available from other sources, is such, that there is not much danger, except in isolated cases, of an excess of nitrogenous manure from without injuriously deranging that balance of constituents within the soil which it is essential to keep up, if not only full, but healthy, crops are to be produced. At present, at any rate, the produce per acre over the country at large is annually increasing rather than diminishing. The probability is, indeed, that any growing derangement in the composition of our soils will show itself in increasing tendency to abnormal growth, or disease of various kinds, rather than in gradual diminution of at the same time healthy crops. There is, however, as yet, so far as we are aware, no well-established evidence showing any clear connexion between the essential conditions of our modern system of cultivation, manuring, and cropping, on the one hand, and the prevalence of particular forms of faulty growth on the other.

Indeed, on many of our heavier soils, and even on lighter ones if purchased cattle-food be liberally employed, corn crops may be grown more frequently than is consistent with what have generally been considered the established rules of good farming, not only without injury to the soil, but with pecuniary benefit to the producer. On heavy soils barley of better quality may be obtained after wheat than after a root-crop. But when corn is taken after corn, great attention should be paid to the cleaning of the land, and manure should be liberally applied. When wheat follows another corn-crop, not less than 50 to 60 lbs. of ammonia (or its equivalent of nitrogen in some other form) should be applied per acre, and when barley or oats follow a corn-crop, from 40 to 50 lbs. The quantity of phosphate employed with the ammonia should be greater for spring than for autumn sown corn-crops. The manures should be applied at the time of sowing the seed.

MISCELLANEOUS COMMUNICATIONS AND NOTICES.

7.—*Mr.* J. B. LAWES *and the Mineral Theory.* By BARON LIEBIG.

IN the last number of the 'Journal of the Royal Agricultural Society of England,' published in 1863, there is a paper by Messrs. Lawes and Gilbert, in which old charges against me, personal and others, are revived; and as they have sent an extract from that paper to all the Universities, Agricultural Colleges, and Journals in Germany, as well as duplicates to myself, it is evident that they attach a great value to their statements, and in order to give others the means of judging them correctly, I think it advisable to answer them.

In my 'Principles of Agricultural Chemistry' (p. 90, 1855), I had called Messrs. Lawes and Gilbert's attention to the fact that their experiments included the proof that farmyard-manure (organic manure) could be entirely replaced by *mineral* manure (for sulphate of ammonia and sal ammoniac are mineral); and, therefore, so far from refuting my doctrine, they had really substantiated it. To this they replied that *ammoniacal salts belonged to the class of organic manure;* that I had always considered them as such; and that in falling back on the strictly scientific meaning of the terms *mineral* and *inorganic*, I was begging the question; was trying by a *manœuvre* or *ruse* to give a new definition to my mineral theory, or rather to substitute for it another which was not my own. Although I tried to convince them by a paper printed in the 'Journal of the Royal Agricultural Society of England' (1856), that I never had considered *ammoniacal* salts an *organic* manure, they return to their accusations now, and endeavour to support them by quoting the following passages of my works:—

"But the weight or amount of the crops is in proportion to the quantity of food of both kinds, *atmospheric* and *mineral*, which is present in the soil, or conveyed to it in the same time. By manuring with *ammoniacal salts* a soil rich in available *mineral* constituents the crops are augmented in the same way as they would have been if we had increased the proportion of *ammonia* in the air."—*Principles*, pp. 77-8 (1855).

"The *mineral* constituents act, as is shown by the produce of the unmanured land, without any artificial supply of *ammonia*.

"The *ammonia* increases the produce only if the *mineral* constituents are present in the soil in due quantity, and in an available form.

"*Ammonia* is without effect if the *mineral* constituents are wanting. Corn-

ıtly, the action of *ammonia* is limited to the acceleration of the action of .*ineral* constituents in a given time."—*Principles*, pp. 86-7 (1855).

. . . . the other is the action of *sulphate of ammonia* as a solvent ːrtain important *mineral* constituents of the soil."—*Ib.*, p. 99 (1855).

Immonia, when used as a manure alone, and when there is a want of *ral* constituents in the soil, is like the spirits which the labourer takes in : to increase his available labour, power, or imagination; and, like that ulant, its action, in this case, is followed by a corresponding exhaustion." ı., p. 106 (1855).

A fertile soil must contain in sufficient quantity, and in a form adapted assimilation, all the *inorganic* materials indispensable for the growth of ts.

A field artificially prepared for culture contains a certain amount of *these edients*, and *also* of *ammoniacal salts* and decaying vegetable matter."— rth edition, p. 169.

t is scarcely necessary to multiply these citations, as the mean- of them is nearly the same.

The conclusion which is drawn by Mr. Lawes from these pas- ·s is the following:—

These sentences will be sufficient to show whether or not Liebig is justified ɔw attempting to fall back, in agricultural discussions, upon the more tly scientific meaning of the terms 'mineral' and 'inorganic,' so as to ıde within them 'ammonia,' 'ammoniacal salts,' 'atmospheric constitu- ' &c., and thus to give a new definition to his mineral theory, or rather ːitute at this date for his own theory, which has proved to be erroneous, ıer not his own."

is quite true that I have contrasted *ammonia* with *mineral* ıtances; but the meaning of these passages must be obvious ny candid reader of my works. I said (4th edition, p. 59)—

No conclusion can have a better foundation than this—that it is the *am- 'a of the atmosphere* which furnishes nitrogen to plants."

ı my 'Principles of Agricultural Chemistry,' from which the passages quoted by Lawes are taken, I said:—

All these substances (phosphoric, sulphuric, silicic, and the alcalic, lime, ıesia, iron, &c.), *are included in the term mineral food* of plants. *Carbonic* and *ammonia are the atmospheric food* of vegetables." (p. 24.)

n my book I had to explain the relation of the atmosphere to soil in the growth of plants, and to distinguish the elements ıished by the air and those by the soil, and to avoid, by con- ting them, a long tedious enumeration of each of these elements, *ch all had been stated as inorganic.* I divided them into two ısses—*atmospheric* and *mineral.*

must admit that some scientific education is required for a ı to understand that the word *atmospheric*, designating *gaseous* ıpounds, like the word *salt* (for ammoniacal salts), in whatever nection they may be used, entirely exclude the idea of *organic.* speak frequently of salts of organic acids (acids derived from anic compounds), but a salt itself is never called organic,

because it is exactly the opposite of organic. As to the term *mineral constituents*, I showed in the 8th chapter of my book that the *constituents of ashes* are *originally constituents of minerals*—thus, potash, a constituent of feldspar; phosphoric acid, a constituent of apatite, &c.—(See also chap. 9, on formation of arable soil, and chap. 12, on fallow.)

From this it will be understood why I used the word *mineral constituent* to designate the constituents of ashes, sometimes of soils, but never for ammonia.

Ammonia is a constituent of the atmosphere, but is *never a constituent of any mineral*: it is *mineral and inorganic, but not a mineral constituent.*

For a man not versed in scientific language, there is some ambiguity in the word *mineral*—at least in Germany we say *sulphate of ammonia is mineral* (in its origin), and the mineralogists say sulphate of ammonia is not *a* mineral (species); but this has nothing to do with Lawes and Gilbert's accusations.

Although the word *organic* does not occur in any of the sentences quoted from my works, and is never associated with ammonia, although I distinctly stated that the opposite of *mineral* constituents was *atmospheric*, they affirm that by atmospheric I understood *organic constituents*. Their mode of arguing is most simple. They take any passage out of my book, twist their own erroneous idea into it, and then assert that, by contrasting ammonia with mineral constituents, I had regarded it as an *organic* manure.

The origin of Messrs. Lawes and Gilbert's statements can scarcely be understood without referring to a definition of manure which Mr. Lawes gave in 1847, and which he is pleased to call his theory. It is the following ('Journal of the Royal Agricultural Society of England,' vol. viii. p. 240):—

"I NOW COME TO THE ACTION OF manures, WHICH are generally divided into two classes—*organic* and *inorganic*. ALTHOUGH THIS DISTINCTION IS BY NO MEANS SATISFACTORY, I SHALL ADOPT IT AS BEING GENERALLY UNDERSTOOD. Organic manures are those which are capable of yielding to the plant, by decomposition or otherwise, ORGANIC MATTER—carbon, hydrogen, OXYGEN, and nitrogen—CONSTITUENTS WHICH UNCULTIVATED PLANTS DERIVE ORIGINALLY FROM THE ATMOSPHERE. Inorganic manures are those substances which contain the mineral ingredients, of which the ash of plants is found to consist."

Before I enter on any discussion of this definition or theory, I must beg to recal the views on the food of plants, which I published in the year 1840. They are contained in the following passage:—

"The elements of nourishment of all green plants are inorganic or mineral substances.

"The plant lives on carbonic acid, ammonia, water, phosphoric acid, sul-

phuric acid, lime, magnesia, potash, iron; and many, too, require common salt."

As I did not admit the existence of organic food, my theory was called *mineral theory*. This name was correct, inasmuch as it was directly opposite to another theory, which prevailed before 1840.

According to De Saussure, Sprengel, Thaer, &c., there were two different laws of nourishment, and *two* kinds of manure, *organic* and *inorganic*.

"*Uncultivated plants*," says De Saussure, "receive their combustible elements from the air, their carbon from carbonic acid; but the products generated from this kind of food possess no value for agricultural purposes. The normal development of *cultivated* plants, on the other hand, and the amount of produce of arable fields, depends on *organic* matter in the soil, on residues of fermentation, and decay of *animal and vegetable matter*."

"Fertile soils contain a mixture of these remains, and their absorption by the roots is a powerful assistance to the food which is contributed by the air and water."

"Plants receive their nitrogen almost entirely by the absorption of the soluble organic substances."

"Mineral substances, marl, gypsum, clay, lime, favour the growth of plants, but take no part in nourishment."—(See 'Bibliothèque Universelle,' t. 3, p. 430; 'Ann. of Chemistry,' t. 42, p. 235.)

This view, it will be seen, is diametrically opposed to my theory, inasmuch as De Saussure maintained the necessity of *organic* food for cultivated plants, and I denied it altogether.

At first sight the so-called theory of Lawes, or his definition of manure, would seem exactly identical with that of De Saussure. Mr. Lawes assumes the existence of different laws for cultivated and uncultivated plants, and of two classes of manure, *organic* and *inorganic*, just as De Saussure and Sprengel maintained; Mr. Lawes does not claim this theory as his own, but states that it was generally understood, though by no means satisfactory.

There are, however, two essential differences between Mr. Lawes's so-called theory and that of De Saussure. First, that Mr. Lawes admits the existence of *inorganic food* or *manure*, consisting of the substances contained in the ashes of plants. The second, that Mr. Lawes applied the name of *organic* manure to something very different from what De Saussure meant. For the first, De Saussure knew nothing of the fact that the ashes of plants were nutritive elements; for he maintained that they (for instance, potash, lime, magnesia), were variable ingredients, changing with the geological formation and character of soils. I think no one can deny that I was the first to point out that the elements of the ashes were really food of plants, and Mr. Lawes has most certainly no claim to this essential part of my theory.

As to the second, by organic manure De Saussure meant

genuine organic matter. Mr. Lawes, however, has not the slightest desire to prove that the *vegetable mould* of Sprengel, or the *organic extracts* of De Saussure, are necessary ingredients of an efficient manure. On the contrary, all his experiments tend to prove that these substances, which cannot be produced in a manufactory, are not necessary. What then does Mr. Lawes mean by organic manures?

The reader will be puzzled to learn that Mr. Lawes's theory, correctly expressed, is exactly the same which I published seven years before his definition of manure :—That the action of manure depends on two classes of bodies. The combustible part of plants derive their carbon, hydrogen, nitrogen, and oxygen, from *carbonic acid*, *ammonia*, and water; the incombustible parts of plants consist of phosphoric, sulphuric acid, potash, soda, lime, magnesia, silica, iron; that "stable manure, the excrements of men and animals, do not influence vegetable life by means of their organic elements, but indirectly by means of the inorganic compounds which decomposition and slow combustion produce; in consequence, therefore, of their carbon being changed into carbonic acid and their nitrogen into ammonia. Thus organic manure, consisting of parts or remains of plants or animals, may be replaced by those inorganic compounds into which it resolves itself in the soil."

The difference between Lawes's theory and mine is simply this—that he has *borrowed the substance of mine* and the *terms* of De Saussure's theory—that he calls ammonia, carbonic acid, and water, which I had called *atmospheric food*, *organic manures!*

There is still a question to be solved :—Were these three substances classed by Lawes as *organic manure* generally understood by that name?

Now it is perfectly certain that neither De Saussure nor Sprengel employed the term organic to denote these three substances, which they knew as inorganic. This denomination can therefore not be referred to them. There exist, moreover, no chemical works published before Lawes's definition (1847), in which they are classed as *organic food* or *organic manure.* It was consequently *not generally understood* that ammonia, water, and carbonic acid *belong to the class of organic manure.* The part of Mr. Lawes's theory which belongs to himself, is merely this erroneous nomenclature; I repeat, that the terms of his definition of manure he has taken from De Saussure, the essence of it is simply mine, but the manner in which he has tacked De Saussure's terms on to my meaning is purely his.

I cannot think that the humblest teacher of chemistry in Great Britain would be content to accept a theory from a man who shows such ignorance of the first elements of chemistry as Mr.

Lawes, and yet Mr. Lawes has the conceit to make believe that I had adopted his definition of manure seven years before he gave it, and that although *it was by no means satisfactory to himself*, it was perfectly satisfactory to a German professor of chemistry.

It is obvious that his definition of manure would be perfectly satisfactory, if *his* word *organic* were changed into my word *atmospheric*, and carbonic acid, ammonia, and water included in the term *inorganic*, to which they are universally assigned. Messrs. Lawes and Gilbert's conclusions belong to that class which goes under the name of *Fallacies of Confusion* in John Stuart Mill's 'System of Logic,' and which comprehends, "among others, all those which have their source in language, whether arising from the vagueness of our terms or from casual associations with them, in which no other causes can be assigned for the mistake committed than neglect or inability to state the question properly, and to appreciate the evidence with definiteness and precision."

If the leading idea of my work is borne in mind, as it is stated in the following passage (4th edition), 'On Manure,' p. 186:—

"A time will come when plants growing upon a field will be supplied with their appropriate manures, prepared in chemical manufactories, when a plant will receive only such substances as actually serve for its food, just as at present a few grains of quinine are given to a patient afflicted with fever instead of the ounce of wood, which he was formerly compelled to swallow in addition,"

it will be seen that all my statements and endeavours were directed with a view to oppose the ruling idea that *organic* manure was necessary to preserve the fertility of fields and to increase the crops. The prejudice in favour of their necessity had grown to be a dogma, and the progress of agriculture depended on the farmers becoming aware of their error.

My whole book may be described as an uninterrupted protest against the existence of organic food of plants, for organic matter cannot in the nature of things be produced by chemical manufactories; and if they were really necessary, chemistry could afford no assistance to agriculture.

If any one will consider the real cause of this sixteen years' controversy, he will be aware that it is a false definition of manure. If Messrs. Lawes and Gilbert had not classed ammonia and ammoniacal salts among organic manures, a dispute upon my theory would have had no excuse. There is something so degrading from a scientific point of view at the bottom of this controversy, that those who have taken part against the only scientific doctrine which agriculture possesses, will look back

with shame when a few years have elapsed; but there is nothing humiliating to me, although much that is highly annoying, for I am not so proud as to think myself humbled when I am fulfilling the vocation to which I have devoted my life—that is, of instructing others. To suppose that in this controversy I was influenced by personal motives would simply be absurd. When I strenuously endeavoured to make the agriculturists view things rightly, it was not for their own sakes, but in order to ward off future evils and the imminent dangers which threaten society at large. Every man of intelligence must see the strongest confirmation of my teaching in all the facts produced in this dispute. Every single experiment of Messrs. Lawes and Gilbert brings new evidence in its favour, and every doubt must disappear by the creation and progress in all countries of Europe of an immense branch of industry—the fabrication of artificial manures from inorganic or mineral substances, which is now extensively employed.

Mr. Lawes's definition of manure, though false in itself, may yet have had, perhaps, a good effect in diffusing more widely these artificial manures, *which are all, without exception, mineral manures.* The prejudice in favour of organic manure was so strong that many agriculturists accepted under that name artificial manure which they would have refused under the name mineral manure, and Mr. Lawes, acting on his definition, could give, in all conscience, the assurance, that their manure for corn contained the *organic* constituent which is most efficacious in stable-dung.

8.—*Use of Green-podded Beans as Food for Stock.*

My dear Sir,—In accordance with your wish, I send you the results of my experience, extending over several years, in the use of green-podded beans, passed through the chaffcutter and given to stock. Horses, cattle, cows, sheep, and pigs, all thrive upon this food. It is especially good for milch cows and for fattening bullocks; so much so, that the latter will leave much of their cake if they get a full allowance of beans. To turn them to the best account they should be allowed to stand till they are well podded. We begin to use them about the first week in July, and continue to do so until the 20th of August, the period varying according to season.

There is a great weight of food in one acre of beans. We calculate that they pay about 7*l.* 10*s.* per acre in meat. It seems strange that so few are used in this manner, even when farmers are very short of summer-feed.

We generally give a little bran and malt-combs with the

beans, and from about the middle of August, when they become fit for harvesting, mix some straw-chaff with them to prevent the bullocks getting "blown."

J. MECHI.

August, 1864.

9.—*On the Advantage of Inoculating Sheep for the Small-Pox.* By JOSIAH DEACON.

ONLY lately returned to England after very many years' residence in Russia, I was both surprised and gratified on reading Professor Simond's able lecture on "Small-Pox in Sheep;" surprised that the question had not been long since decided, gratified at his masterly and conclusive treatment of the subject. I venture now to add my humble testimony, derived from twenty-five years' experience in the steppe country of Mid and South Russia, where I have had landed estates under my administration with flocks of merino sheep varying from a few thousand head to upwards of twenty thousand. On these inoculation was systematically employed with unfailing success. Although the sheep under my charge were perpetually exposed to contagion, from the existence in our immediate neighbourhood of flocks in which thousands have died from the neglect of this precaution, *I never lost an adult animal from the ordinary small-pox.*

In order to show the impossibility of avoiding contagion, I may state that the only boundary-mark between properties in the open steppe country is a deep furrow made with the plough, which is soon overgrown with grass. The shepherds are accustomed to meet on the border to chat with their neighbours. However strict the orders were not to approach a neighbour's frontier when his sheep were tainted by this disease, I have myself more than once caught the shepherds returning from, or close to the frontier when such a flock was in sight. Detection is, however, very difficult, as twenty thousand sheep would be spread over a space of some forty or fifty thousand acres, divided into many farmsteads.

I have heard of sheep which had been inoculated having caught the infection, but have frequently traced the cause to imperfect inoculation, which was not unfrequent so long as the operator merely passed an impregnated thread through the ear of the animal; but, as soon as the plan of making the puncture under and on the fleshy part of the tail became general, such failures were less common. I was as particular in insisting on the careful inoculation of our lambs as on the vaccination of the children of the peasants. Our losses of *lambs* from inoculation

were so trifling that we never kept a separate account; they were merged in the general total of yearly losses.

The only precaution considered to be necessary was not to inoculate during very hot or cold weather; the latter, in particular, proved fatal by preventing the free formation of the pustules and driving the disease inwards. Those who have the general charge of large flocks in Russia are mostly Germans who have some knowledge of the veterinary art, and I never yet met with one of them (I have had many under my orders) who doubted for one moment the efficacy of inoculation; on the contrary, it is considered by them to be one of their most important duties to perform that operation with success. The German sheep-inspector, who is always well paid and is intelligent, would as soon think of being *without his pipe as without his inoculating needle!*

I shall be most happy to give any further information on this head to any one requiring it; my address will be with the worthy Secretary of the Society.

10.—*On Subsoiling Pastures, with a description of a new Implement.* By H. Wood.

As the breaking-up of meadow-land is prohibited by most farm-leases under a heavy penalty, my attention has long been directed towards the best means of improving it. I venture to lay before the readers of the Society's Journal a brief statement of the results of my experiments during the last 20 years.

The roots of meadow-grass require nourishment as much as those of garden or field plants under spade or arable cultivation. I have known them sometimes to penetrate to the depth of 18 inches, finding their way into the holes of rabbit-burrows; at other times they have become so interlaced and interwoven as to prevent the downward percolation of water, even after a heavy fall of rain. Puddles of water on the hide-bound surface of meadows tend to rot the grass, and where open drains are constructed, the water in passing off not unfrequently carries away with it portions of manure held in solution or suspension, and thereby robs the land of nourishment. To prevent this waste of valuable fertilising constituents, I have adopted the practice of scarifying or cutting through the surface of the meadow to the depth of 12 or 13 inches; and a passage being thus opened, through which the water can filter, every particle of manure contained in it is retained by the soil, just in the same way as an ordinary domestic filter abstracts and detains the impurities of drinking-water.

The implement which I use for the purpose is a scarifier, 6 ft across the back beam, and 3 ft. across the front. It was originally made for tines of 3 sizes, but for these I have substituted curved knife tines to be affixed to the cast-iron frame, at a distance of 2½ ft. or 3 ft. apart. The knives are so curved that their point is 15 inches below, and 15 inches to the right or left of the head. The weight of the implement is from 4 cwts. to 5 cwts. and as I only use it at the end of October or beginning of November, when the ground (a tenacious soil on a clay subsoil) is soft and well saturated with rain, a pair of horses can draw it with ease, and make 7 acres of good work in a day. I prefer working at a depth of 12 or 13 inches, but this can be regulated by raising or depressing the wheels, of which there are 2 pairs so placed as to keep the implement in true position. Taking the cost of horse-hire at 8*s.* per diem, and wages at 2*s.*, the cost of the operation will average about 1*s.* 2*d.* per acre.

After the heavy autumnal rainfall the surface of the meadow should be brought to a level with the roller before the scarifier is used.

Woodhill, Ripley.

ABSTRACT REPORT OF AGRICULTURAL DISCUSSIONS.

Meeting of Weekly Council, Wednesday, February 17th. LORD FEVERSHAM in the Chair. MR. J. B. LAWES, of Rothamsted, Herts, introduced the subject of

THE ACTION OF COMMON SALT AS MANURE.

He said: Salt is a substance very largely used by the agriculturists of Great Britain, and supposed to possess very valuable properties. Among its other advantages, it is said largely to increase the production of grain and straw, and to improve the quality of both. It has also the reputation of producing very great effects on certain crops of marine origin, such for example as mangold wurzel, for which it is much used, and of fixing ammonia in the soil, and conveying moisture in dry seasons. Many experiments on the advantages resulting from the use of salt have been published, but I do not propose to refer to them, because last year certain owners of salt works offered a prize for the best essay on that subject; and when published, it will doubtless contain all that is known as to the good qualities of salt. There is great difficulty in arriving at definite conclusions with regard to the actual value of manures, and forming a correct pounds-shillings-and-pence notion of their effects in the soil. Sinclair states, as the result of experiments made in 1817, that while 45 tons of dung gave between 40 and 50 bushels of wheat per acre, 6½ bushels of salt gave above 70 bushels, and 45 bushels of salt gave above 90 bushels. Experiments such as these, however, cannot be accepted in the present day; and I propose to pass over results published with regard to salt, and to confine myself to some experiments which have been carried on upon my own farm.

The field to which I am now about to refer was manured for turnips in 1839, after which there were removed from the land, barley in 1840, peas in 1841, wheat in 1842, and oats in 1843, without any manure being applied, by which the land was brought into a level and comparatively exhausted condition. In 1843 it was sown with wheat, and has been under that crop ever since. The particular experiments to which I am going to refer were conducted on plots A and B, consisting of about one-third of an acre each, and running parallel to each other down the field. With one exception these two plots have, for 20 years, received exactly the same description and amount of artificial manure each year. In 1844, 1845, and 1846 they received the same manures; in 1847 one received rather more artificial manure than the other, and therefore I pass over those years. The Table to which I am going to refer gives the average produce of 1848, 1849, and 1850; for 1851, 1852, and 1853; and then for the last ten years. The difference

between A and B is this: they both received exactly the same amount of other artificial manure; but A, unlike B, received for three years together 3 cwts. of common salt per annum in addition to the other manures. The parallel is exact, with that exception; and if there be any difference in the produce it must be due to the salt.

WHEAT YEAR AFTER YEAR ON THE SAME LAND.

PLOTS A and B the same mixed MINERAL and AMMONIA MANURE each Year; and A 3 Cwts. of Common Salt, per Acre, in addition, in 1851, 1852, and 1853. Produce per Acre, &c.

Averages of Harvests.	Dressed Corn. Bushels.		Dressed Corn. Weight per Bushel (lbs.)		Total Produce, Corn & Straw (lbs.)		Corn to 100 Straw.		Offal Corn to 100 Dressed.	
	Plot A	Plot B	Plot A	Plot B	Plot A	Plot B	Plot A	Plot B	Plot A	Plot B
1848, 1849, and 1850 (3 years before using salt)	32¼	32¾	61·6	61·1	5988	5976	57·2	56·0	6·7	6·3
1851, 1852, and 1853 (3 years with salt) . . .	30	30¼	56·9	56·7	6535	6568	42·6	41·7	12·3	11·0
1854–1863 (10 years after using salt)	40¾	40¾	58·4	58·4	7799	7811	49·6	50·4	7·4	8·3
1848–1863 (16 years) . .	37¼	37¼	58·7	58·7	7222	7234	49·7	49·8	8·2	8·4

Sometimes when a manure has been applied to the soil, the ensuing year happens to be favourable, and this may not be the case at another period. Therefore, to arrive at exact conclusions, we must follow the results down from year to year for a considerable length of time. It will be seen by referring to the Table that the mean produce of 1848, 1849, and 1850, the years previous to the application of salt, was 32¼ and 32½ bushels respectively; showing that the crops of wheat were extremely alike. There was, in fact, no difference between them. Again, in 1851, 1852, and 1853, the years in which A received 3 cwts. of salt per acre per annum, and B did not, the produce of wheat per acre was exactly the same, being 30 bushels in each case. Then, in the next ten years the produce was again nearly alike. The produce of the sixteen years was in each case 37¼ bushels; showing that there was no trace whatever of the action of the 9 cwts. of common salt.

Some persons think that although salt may not increase the quantity of produce, it improves its quality. Let us see what was the weight of the grain per bushel. In the first three years the weight was a little higher in A than in B; in the three years 1851, 1852, and 1853, when the salt was applied, the difference was again slightly in favour of A, though not so much as it was before; and in the next ten years, the weights per bushel were almost exactly alike. In point of fact it made no difference whatever, whether we used 9 cwts. of common salt or not.

I now come to the total produce of straw and corn as shown in the second division of the Table. The total annual produce of the first three years was 5988 lbs. against 5976 lbs., a difference of a few pounds only; in the three years when salt was used the produce was as nearly

as possible the same; and in the ten years after the salt was applied, the average produce was 7799 lbs. against 7811 lbs.—again a difference of only a few pounds. In the total average produce of the whole period of sixteen years the difference was only 12 lbs., 7222 lbs. against 7234 lbs.

The next columns show the relation of corn to straw. Salt is supposed to strengthen straw and improve its quality. The figures show the proportion of corn to 100 straw. In the first period, before salt was applied, A, having 57 lbs. of corn, was rather superior to B, which had 56 lbs. In the next period we have 42·6 against 41·7, there being again a slight difference in favour of A. In the next ten years the case was reversed, and the result was in favour of the land which received no salt, the figures being 49·6 against 50. Again, in the sixteen years the comparison is 49·7 against 49·8, being a very little in favour of B. Taking the whole period, there is, practically, no difference in the proportions of corn and straw.

I must now speak of the proportion of offal corn to 100 lbs. of dressed corn as shown in the last column. In the first three years A was in this respect slightly superior to B. In the three years in which salt was applied, the reverse was the case; that is to say, the quantity of offal corn was a little larger when the salt was used. In the third year of this second period, I may remark, the balance was still greater against salt; the offal corn was then 17 on A, to 13 on B, showing that the salt had the effect of injuring instead of improving the quality. In the next ten years the result was 7·4 in A to 8·3 in B. Taking the sixteen years the results are almost identical; that is to say, we see no effect whatever from the use of salt in these careful and prolonged experiments.

Turning now to the action of salt upon another crop, I may remark that on my own farm I generally grow from 10 to 15 acres of mangold wurzel a year; and, following the common custom, I have usually applied salt to the land. My usual course has been to apply half a dressing of dung in the autumn, and half a dressing in the spring, and then the 2 cwts. of guano or some other artificial manure, and 4 cwts. of salt per acre, the salt and artificial manure being strained on the top of the dung, and ridged in, and the seed dibbled on the top. As everybody says that salt is good for mangold wurzel I have always used it; and, assuming that it did increase the crop, I was anxious to ascertain more exactly the extent of its effect. Last year I ordered one acre to be manured with 5 cwts. of salt, another with 10 cwts., and another to be left without any salt, the other manures being the same in the three cases. One thing which struck me immediately was, that the plants which had no salt grew faster than those which had it. There could be no mistake about the matter. The salt evidently appeared to check the growth of the mangold wurzel. This went on for a good many months, and at one time there was a great difference between one set of roots and the others. The crops were very carefully weighed, with the following result:—The produce per acre in roots was, without salt, 21 tons 2 cwts.; with the smaller quantity of salt it was 20 tons

10 cwts.—a difference of 12 cwts.; and where 10 cwts. of salt were applied there were only 18 tons. Again, as regards tops, where there was no salt the produce of tops was 7 tons 6 cwts., where the smaller quantity was applied it was 8 tons 5 cwts., and where the larger quantity was used it was 7 tons 8 cwts. Therefore the result was, that where the smaller quantity of salt was used there was more top and less bulb, and where the larger quantity was used both top and bulb were less. These experiments are for one year only, and therefore I do not rely much upon them. I am satisfied that this year salt has checked the growth of mangold wurzel rather than promoted it; and though this may have been because the season was a very dry one, the effect was certainly very distinct.

I have one more set of experiments to bring before you; they are not my own, but were conducted some years ago by Mr. Keary on the farm of the Earl of Leicester. Mr. Keary who was a very strong advocate for salt, and contended that it did a great deal of good, was kind enough to send me the result of some experiments which he made upon wheat in the years 1852, 1853, and 1854. His practice was, he stated, to put 6 tons of dung, 1 cwt. of nitrate of soda, and 2 cwts of salt, mixed together, per acre. In some cases his separate experiments are comparable with one another. For example, in one case he used only 1 cwt. of nitrate of soda, and in another 1 cwt. of nitrate of soda with 2 cwts. of salt. In the first year the nitrate of soda with the salt gave 37¾ bushels, and the nitrate without the salt gave 42¼ bushels; in the second year the nitrate of soda with the salt gave 33¾ bushels, and the nitrate of soda without it 35 bushels; in the third year the nitrate of soda with the salt gave 47 bushels, and without it 49½ bushels. In the three years there was a difference in favour of the nitrate of soda without the salt of 8½ bushels of wheat and 6 cwts. of straw. The results of these experiments were sent to me by Mr. Keary to show the great value of salt, whereas I might cite him as a witness against salt as a manure. It may be that sufficient care was not exercised in making the experiments in the instance referred to; but be that as it may, the result is to show a loss in three years of 8½ bushels of corn and 6 cwts. of straw, arising from the use of 6 cwts. of salt.

Some years ago a French commission was sent to this country to inquire as to the effect of salt on corn. I never saw the Report of that commission; but the other day I wrote to Monsieur Barral (editor of the 'Journal d'Agriculture Pratique') to make inquiries about it; and in his reply he states as follows:—

"Paris, Feb. 8th, 1864.

"The Report you mention is written by Mr. Milne Edwards. It was printed at the 'Imprimerie Nationale,' at the expense of the French Government, in January, 1850. Mr. Milne Edwards was then trying his best to prove the possibility of restoring the old tax on salt without doing any injury whatever to agricultural interests; consequently, he declared most readily that *salt is useless as a manure*, and his opinion may be suspected of being tainted by some political prejudices. Nevertheless, I believe in the

truthfulness of that part of the Report, and am myself prepared to declare that salt is of no value *at all as a manure*, if used without any other fertilizing matter. But I am ready to alter my opinion respecting *mixtures*, as double decompositions may be produced in the womb of Mother Earth."

Thus it appears that M. Barral is of opinion that salt has no value as a manure itself, but that it may act usefully in conjunction with other manures. So far as my own experiments have proceeded, I have always used it in conjunction with other manures; but the results have not been satisfactory.

It may be asked, Why should not salt be useful when we find it existing largely in a certain class of plants? There can be no doubt that salt is to be found in a certain class of plants; but the question of the value of salt depends, I think, not so much upon what is found in the plant as upon what is sent off the farm. If salt is taken out of the land by a plant which is consumed on the farm, as is the case with mangold wurzel, it may be concluded that the salt is not exported, and that it therefore needs not to be replaced by import. As to grain, an analysis of ripe corn will show that it contains little or no salt: there is just a trace of it, and nothing more.

Animals undoubtedly contain salt. I have had a great many animals analyzed at different times, and you may assume, as a general rule, that an animal, as he stands alive, contains about 3 per cent. of mineral matter; an ox about 4 per cent., and sheep and pigs about 2½. Three per cent. may be taken as an average of mineral matter, and of this about 8 per cent. is salt. Therefore an ox weighing 1000 lbs. contains about 2½ lbs. of salt, and a sheep or a pig weighing 1 cwt. contains about 4 ounces of salt. Hence the amount of salt carried off the farms by animals is very small indeed.

A great many experiments have been made for the purpose of ascertaining the amount of salt which falls on the land through the medium of rain. I do not wish to go into figures, but there can be no doubt that a large quantity does descend in that way upon our soil. In our climate, surrounded as we are by sea, the fall of salt in rain is decidedly larger than the amount carried off the land by salts from the farm, and consequently, so far as our fields require salt, they obtain it from that source.

Without expressing any very strong opinion on the subject, I would say that the general conclusion at which I have arrived is that salt does not act beneficially as a manure, though it has occasionally an action of some kind or other; and that if there are many well cultivated farms on which salt is used, there are also many which are kept in the highest condition without the purchase of it. I am not at all prepared to say that the former are not as well farmed, or do not produce as good crops as the latter. I cannot help thinking, that the large amount of money which is expended annually on salt as a manure throughout the British Isles is not returned in the produce. There may be some cases in which it is, but I think that, as a general rule, the outlay of money is not returned in increased production.

In answer to the Chairman, Mr. LAWES said, as the result of experiments on the effects of salt in the feeding of cattle, he had arrived at the conclusion that, though it might be very well to give animals a taste of salt, great care should be taken not to supply it in excess.

In answer to Mr. Dent, who thought that Mr. Lawes might have used an excessive quantity of salt on his farm, and thereby retarded the growth of his crops, Mr. LAWES replied, that 4 cwt. per acre of salt had been his ordinary dressing. His object had been to grow large crops, and he assumed that salt was likely to be beneficial to mangold wurzel, but though there was plenty of plant it was possible that, in the experiments referred to, the application of salt might have been excessive.

Mr. FISHER HOBBS, having prefaced his remarks by observing that a good deal depended on the character of the climate and soil where salt is used, said:—So far as my experience goes, I may remark that in the eastern parts of England, where we have a dry climate, we find, especially in the case of marine plants, that salt is very beneficial. We also perceive that along the coast, where the air is impregnated with salt, we can grow mangold wurzel, even without farmyard-manure, better than in other situations. Not only so, but the quality of the crop is decidedly firmer, and mangold is generally admitted to contain more saccharine matter there than in parts of the interior where high farming is carried on. Therefore I think the remarks which Mr. Lawes has made to-day only show that, so far as his experiments have gone, they have not proved salt to be of very great service. I believe that salt and guano, mixed at the rate of about 3 cwts. per acre of each, form an excellent manure for both wheat and mangold wurzel. We have found in my own county that where salt has been used through a course of cropping, especially on marls and other similar lands, it has not produced the same advantages that it did previously. I myself have used it to a considerable extent at various periods of the year, and have been occasionally annoyed at having my attention called, particularly after frost, to the bad appearance of my wheat, where salt had been applied. One great benefit of salt in our dry climate is, perhaps, in its destruction of many insects in the soil, which for the last few years have been very injurious, not only to our root-crops, but also to many of our cereals. I know very well that we cannot lay down any general rule with regard to modes of cultivation or the application of manures; but I do not agree with Mr. Lawes that, on the whole, salt has been too highly valued by farmers. I think he will find, on examination, that even in a humid climate it is beneficial. In Cornwall, fishery salt, as it is termed, appears to be used almost universally for stiffening straw. In my experience I have seen fields of wheat where 3 cwt. of salt per acre had been applied, and the straw was remarkably white and very stiff, while in other cases a much smaller application has apparently produced an equally beneficial effect. On the other hand, I have known salt prove very injurious when applied to a crop of swede turnips, though when applied to mangold on the same soil it produced a good effect. We see in our gardens how beneficial salt is to asparagus, which is a marine plant. Again,

sea-weed, which of course contains a considerable proportion of salt is now extensively used, and the more its effects are seen, the greater is the demand for it. I do not think that salt should be run down as if it were a thing of no agricultural value; for there are soils and climates where it is very beneficial when used judiciously.

The CHAIRMAN having testified to the beneficial effects of salt in arresting the ravages of the turnip-fly, asked Mr. Hobbs whether he had known salt alone to be efficacious in destroying insects?

Mr. FISHER HOBBS said he had never found any active property of that kind in salt when applied by itself, but in combination with other manuring ingredients it had so operated. A more powerful agent than salt was required to destroy the fly; and it should be applied when the plant was humid, for it would then act most beneficially upon the leaf.

Mr. DENT, M.P., would like to know whether Mr. Lawes had made any experiments with salt on grass land. A notion had generally prevailed that the application of salt to land bearing rough or coarse grass had a tendency to produce a finer kind of herbage. He had always been in the habit of applying salt for mangold wurzel. For some years he grew very good crops, but he did not believe that for the last four years any one in Yorkshire had produced a satisfactory crop; yet the crops there had, he believed, been grown very much in the same manner every year, and with the same proportion of salt. The use of salt had certainly, in Yorkshire, the effect of stopping the maggot, which was eating the leaf.

Dr. VOELCKER said, from what he had seen on a large scale in passing through different counties of England, and from his inquiries into the circumstances under which salt had been used, he had come to the conclusion that in light and sandy soils salt was often, if not generally, used with very great benefit; while on heavy soils it was attended with either no advantage whatever, or decided disadvantage. Amongst the properties of salt there was one which belonged, he believed, to all very soluble saline matters, viz., that of retarding the growth of plants when applied in quantities of above 3 cwt. per acre. Salt certainly retarded the growth of plants, and for that very reason it was, he believed, that it was of such great utility on the lighter soils. It kept the plant for a longer time vegetating and in good growing condition, and the final result was a larger produce, especially in the case of mangolds. In the eastern counties the moderate use of salt had very materially increased the root-crop, and, as he believed, in virtue of its retarding the growth of the plant. In lighter soils, when dry weather set in, roots were very apt to dwindle away, or to yield only half crops; but by applying salt in moderate quantities provided the land were otherwise well manured, the life of the plant was prolonged, and a larger crop ultimately obtained. But the reverse of this was the case when salt was applied to heavy land. In some parts of Gloucestershire the crop was sometimes taken up before it was ripe, and the mangold was there less valued in consequence. The use of salt on stiff clay soils, such as those referred to, would further retard the ripening. The use of manures like superphosphates, which

promote early maturity, was here advisable. The question, in fact, was entirely one of maturity.

Salt was taken up in immense quantities by plants. Some time ago he made some experiments on that subject, and he was amazed at the enormous quantity which he found plants to absorb. Salt being assimilated by plants, circulated in them; and, according to their structural differences, some plants were benefited and others destroyed by it. Cabbages would take up an enormous quantity of salt. He had seen a plant with the salt taken up by the roots crystallizing on the leaves. This property of assimilation in salt was very useful for some purposes, but injurious in others. The question was, in fact, altogether one of soil. Therefore he believed they were not justified in saying, on the one hand, that salt was of no use; or on the other, that it was of very great use. It depended on the application which was made of it whether it would be useful or the reverse. Some years ago he made some experiments on grass-land with salt and with nitrate of soda. Now nitrate of soda pushed on the growth of grass, and secured a larger produce. Salt, on the other hand, checked it to such an extent, that if they used on stiffish land as much as 10 cwt. per acre, they would get less crop, even though nitrate of soda were used with it. Cattle were very fond of salt grass, naturally preferring sweet to rank herbage; and if cattle, especially when out of condition, were placed in fields where there were large deposits of ammoniacal manure, salt would be of great advantage in checking rank vegetation and sweetening the herbage. But, then, while salt sweetened the herbage, it diminished the total amount of produce. He would only add, that his last year's experiments in mangold, so far as they went, tended to confirm the view taken by Mr. Lawes. By the use of various quantities of salt, beginning with 1 cwt. and going up to 9 cwt., he obtained results which did not prove that on a heavy calcareous clay salt produced a beneficial effect.

Mr. J. Hooker (Oatlands, Walton-on-Thames), said: Having made some experiments with salt, he had put down the results, which did not at all accord with those of Mr. Lawes. His soil was a rather stiff clay resting on a sandy subsoil, on the banks of the Thames. He took the land in 1860 in a very foul condition. Ten acres he was obliged to fallow. Four acres by the side of them, and with precisely the same kind of soil, he planted with mangold wurzel, for which crop he applied 4 cwt. of salt per acre at different periods of the year. In the autumn of 1861 he sowed the plots with rough chaff wheat over the whole fourteen acres. The plant came up well, and looked remarkably well up to the time of blooming, giving the promise of a large crop; but then the crop on the ten acres which had received no salt entirely broke down. The yield was as follows: the four acres salted gave 30 bushels per acre of good quality; the ten acres which were not salted gave 20 bushels per acre of tailing quality. He selected samples of straw from each piece for analysis in order to see what was the cause of this failure, and whether salt or the want of it had anything to do with the result. On examining the ash of that grown on the salted land he found that it gave 83 per cent. of silica; whereas

the ash of some of the best straw that could be found on the land not salted only gave 78·94 per cent. of silica. Moreover, the straw of the salted land was by far the brighter of the two, and was much harder for the reapers to cut, a consequence of its containing more *silica.*

The next year he conducted a series of experiments on the same kind of land, though not the same pieces. The wheat was drilled in the autumn of 1862, and 1½ cwt. of salt per acre was sown broadcast on the 12th of May, 1863. A few plots in the piece were not salted; at harvest several pieces of each were carefully weighed. The following is the mean result of this experiment:—The land salted gave a produce of 2475 lbs. of wheat per acre, and that not salted gave a produce of 2337 lbs.; showing an excess of 138 lbs. per acre on the salted land. Further, the land salted gave a produce of 3389 lbs. of straw per acre, and the land not salted a produce of 3150 lbs.; showing 239 lbs. per acre extra on the salted land. The greater weight of straw in proportion to the wheat, is accounted for by the finer quality of the straw, which containing more *mineral* matter than that grown on unsalted land, consequently weighed heavier. He agreed with Professor Voelcker that on stiff land a small quantity of salt was better than a large quantity, and that it ought to be used sparingly in each application; he would prefer manuring the root-crop with salt to its direct application to cereals.

Mr. Lawes, in replying to the various criticisms on his remarks, said, it might be supposed that his land was not favourable for an application of salt; but it should be observed that his experiments with mangold wurzel were carried on, not upon experimental land, but as part of his ordinary farm practice; the soil being a heavy loam resting on yellow clay. Mr. Keary's experiments were also part of what is termed farming practice; and, though he said that salt was a capital manure, the results which he gave tended to show the contrary. He appeared, indeed, not to have analyzed the results of his own experiments. He (Mr. Lawes) agreed with Dr. Voelcker that when salt was applied to grass-lands the herbage looked better and the cattle seemed more fond of it; but he doubted, nevertheless, whether the grass contained the best meat-producing qualities, nor, indeed, did he think that salt ultimately increased the amount of produce. He also concurred in the Dr.'s opinion that salt checked the growth of plants; but whether that was an advantage to the farmer was another question. Did they wish their crops to be stopped at particular stages of growth? They all knew that in some years crops were too ripe in autumn, and at others not ripe enough. That was a matter which depended on the seasons. One year there was a hot summer, ripening the crops too early, the next year perhaps the case was reversed; and a manure like salt would perhaps be beneficial at one period and not at another. As regarded cattle, they knew that cows fed much on mangold wurzel were apt to scour. What they ate operated on them like a dose of salts. As agriculturists, they did not want to accumulate salt in mangold wurzel; what they needed was good feeding qualities, and the question of the value of salt and other manures depended on their

influence on the feeding properties of crops. In conclusion, he did not deny that salt might act beneficially if used judiciously on lands which were suitable to it; but when applied extensively and without great care and discrimination the crop would not, in his opinion, pay for the outlay.

Mr. FISHER HOBBS, in opposition to the remark that the scour in cattle arose in a great degree from the salt present in mangold wurzel, said, that when sheep had too much vegetable matter, and showed symptoms of scour, almost the first thing the shepherd did was to give them a handful of salt, and in nine cases out of ten it proved a corrective.

Mr. LAWES observed that what he had referred to was an accumulation of salts in mangold, which gave them a purgative character.

Mr. FISHER HOBBS suggested whether mangold wurzel, being a marine plant, might not on that account take up more salt beneficially than was done by swedes and common turnips. He had himself observed that when salt had been used to a considerable extent for the mangold wurzel plant, it produced no injurious effect, whereas the swede died off with the same amount of salt.

Mr. LAWES said he had, in fact, never grown mangold wurzel without salt; but, this year, having occasion to make experiments in relation to this question he found, to his surprise, that his crop seemed much better without salt than with it. He had been as steady a user of salt as any one, and, if questioned on the subject, he should probably have said that mangold, being a marine plant, required salt; but, after his recent experience, he should look a little more carefully to his consumption of salt another year.

Mr. R. BARKER moved a vote of thanks to Mr. Lawes, and the Chairman, before putting it, said he believed that agriculturists would gladly avail themselves of any information to be derived from the practical experience of trustworthy persons who engaged in such investigation.

Mr. LAWES having returned thanks, the proceedings terminated.

Meeting of Weekly Council, Wednesday, March 16th. Mr. RAYMOND BARKER in the Chair. Lecture by Mr. ALFRED HUGHES, of Thorness, Isle of Wight, on

THE MANAGEMENT OF CLAY LANDS FOR SHEEP-FEEDING.

Mr. HUGHES, in recommending his "scheme" or system of management, commenced with the remark that he had had two years' satisfactory experience of it on a very stiff clay farm, near Cowes, in the Isle of Wight—on land not adapted to the four-course shift, nor kind to barley; which, though it will grow valuable roots, defies the tenant to turn them to any profitable use. The farmer of such a soil, he continued, is deprived of two important sources of income: a good yield of useful malting barley, and the production on the land itself of a large quantity of mutton. He then proceeded as follows:—

The system of management which is set forth in this Paper is in-

tended only for such land as that described; and those whose lot cast on a kinder soil, not subject to these conditions, will probably fi nothing in this scheme that will assist them in their business. M object has been to discover a course of cropping adapted to this so to relieve it to some extent of the heavy burdens and innumerab difficulties which beset its tillage, and to find the means of profitab consuming the greater part of the root-crops on the land. The dif culties attending the management of clay-land are too well known all engaged in it to need minute description. We have all seen th long rugged tracks of the cart-wheels in our turnip-fields, and th corresponding yellow scars in our barley crop, in the month of Jun as the result of carting off our roots to the ungrateful bullock at hom We have also seen the thin barley and thinner seeds, where stood t puddled fold and unhappy sheep, afterwards the battle-field of Cl and Crosskill. Where spring corn is to follow the root-crop land like this, and in a climate like ours, these things must happe but what worse preparation can there be for our most valuable, m sensitive, and most delicate plant, barley? Then, again, on tak wheat after clover on such land, when there has been rain enough admit of its being ploughed, the land comes up so tough and stubb that the wheat can only be put in by force, and buried or rather hid in its water-tight drain, by a vast amount of horse-labour and w and tear; whilst if the season be unfavourable, the wheat is not into the land till winter is come. Now, though wheat likes a fi bottom, the seed of wheat, like all other seeds, does not like to wedged up in a water-tight bed, smeared over with the harro Wheat likes an early start, and its produce is, *ceteris paribus*, ve much in proportion to the progress it makes in the first quart of its growth. If our soil, therefore, is naturally tough and bindin we must adopt such a mode of preparation as will afford as kindl a seed-bed as possible. Our seed must fall into soil in a conditio favourable to a rapid development of root and stem. Again, with re gard to our most valuable heavy-land roots, mangold, if they ar grown after wheat, even with the most active autumn tillage, the tim of preparation is so short that we do not get either the weight o the quality of root which the same land is capable of producing whe exposed to the influence of a midsummer sun.

The system of cultivation which is set forth in the diagram (see p 524 and 525), meets these drawbacks to our success, and by affordin seasonable and ample time for the profitable consumption of a ve large amount of green crop on the land by sheep, enables the heav land farmer to participate in the advantages of sheep-farming. renders the farm self-fertilizing, the haulage of the root-crop home avoided, and by growing for the most part roots that will store on th land, and taking no corn-crop in the spring, ample time is afford to consume the root-crops with advantage to sheep and land. Th rotation is so arranged as to defer the repetition of each crop f seven years instead of four; and the subdivision of each course affor an opportunity of removing clover and such crops as are most sensiti on the point of repetition, to an interval of fourteen or twenty-o

years. A great advantage accruing from this arrangement, and one saving much labour, is the time allowed for the preparation of the seed-bed for each crop, especially the three with which under the four-course we have the greatest difficulty,—wheat, barley, and mangold; the latter getting a summer as well as a winter fallow, by which a weather-made surface is secured, and an immense amount of forced labour at seed-time is dispensed with.

Another collateral advantage arising out of this septennial division is the severance of the periods of sowing into smaller tasks, so that, if begun in time, none are likely to be protracted beyond due season, to the detriment of the crop itself, and the hindrance of all other work on the farm. Summer preparation for wheat renders wheat-sowing, perhaps, the lightest seed-time of the season; it affords the best opportunity for adopting thin and early sowing so well suited to a clay soil, and by being quickly out of hand it leaves the teams free to push on the autumn tillage, and, while the land is solid, to run off that portion of the root-crop destined for consumption on the old leys, and pastures, and in the homestead. The old leys remaining unbroken through the wettest portion of the winter afford a firm and healthy run of feeding-ground for the sheep when the ploughed lands will not bear them. A quantity of drawn roots should be securely stored at some convenient spot near at hand, that they may be supplied with as little labour and carting as possible to the sheep when they are driven from the fold on the turnip-land. These old leys coming into fallow for roots, and being firm and clean on the top, will bear the sheep and the carting without damage to the next crop. The sheep, when driven from these lands by the plough must be kept in hurdles, and fed with the stored roots on a dry pasture till they can take to the turnip-land again. I consider this system, and such a provision of green crop peculiarly adapted to the requirements of a flock of ewes, especially Dorsets, as both the fatting of early lambs and then that of the ewes may be accomplished on the root-crop only. I then buy in a lot of tegs to take off the summer folding of tares and rape, feeding with corn or cake, my object being to sell out in the middle of October, when they will have folded over the course intended for wheat. This year, as mutton sells well, I have kept nearly all wethers through the winter, and have fatted them with very little trouble. The plan I pursue with sheep is this: sheep bought in in September or October take the run of the stubbles, and go into fold on the land intended for winter beans or winter oats, as long as the weather remains fine. Directly it gets too wet for them there I move their night-fold to the old Italian rye-grass ley, where they find a nice fold of grass with good lodgings. When the stubble-feed gets short I send them to fold on the early white turnips; and having once commenced doing so, I would always rather carry out a little litter and bed down a fold or two than be driven off by the first rain. If wet sets in, we come off to the fold on the ley ground, and supply the sheep from the stock drawn for that purpose, until we can get on to the turnip land again. There is plenty of time, as there is no corn-crop to follow; and with a little perseverance the difficulties of the season will be overcome. The great thing, in this heavy land-folding

DIAGRAM, SHOWING SUCCESSION

WHITE WHEAT.	RED WHEAT.

Commence sowing in September with 1¼ pecks per acre; hoe in autumn and again in spring;
white wheat where the winter tares and rape were fed, and change ground each rotation.

BARLEY.

Commence sowing first dry time after February is in, and weed at every opportunity.

WINTER BEANS.	SPRING BEANS.	EARLY PEASE.

Cart a good dressing of farmyard dung for this course; sow early, hoe and weed frequently.

BLACK TARTARIANS.	WINTER OATS.	CANADIANS.

Break up and clean well after winter beans and put in Tartarians in March; clean well after beans and pease; put winter oats on the spring bean land and the Canadians on the pea-la
change ground every rotation; dung for this crop, and hoe for seeds.

CLEAN CLOVER.	TREFOIL. COW-GRASS. DUTCH CLOVER. ITALIAN GRASS.	SUTTON'S IMPROVED ITALIAN RYE-GRASS.	TARES REQUIRED MOWIN

Apportion the above crops according to the requirements of your business; drill all the seed wh
hoe oats between the rows of corn; top dress early Italian rye-grass with 3 cwts. of guano, o
to go on in autumn, one in spring.

SWEDES AND HARDY TURNIPS.	EARLY TURNIPS AND MANGOLD-WU

Put the mangolds on the tare-land and dung for them, and follow with such roots as store well
a fair breadth of early white turnips.

SPRING TARES, OR RAPE.	WINTER TARES, OR RAPE.

Put winter tares on first land cleared by sheep, breaking with plough or cultivator accor
season, and follow with spring tares, rape and mustard; scuffle in the sheep-dung and
shallow on the ridge for wheat.

Probable System and Cost of Tillage.	Cost of Field.	Cost per Acre.
	£. s. d.	£. s. d.
h *Coleman's Cultivator*, using smallest size triangular share, close behind the *sheep*, irst time, and cross the work with 4 horses afterwards. Harrow with heavy ; horses; roll down with pair horse roll. Labour—clearing round the field, ut and ploughing, 2 horses; three harrowings before drill and one after, 2 horses; striking up furrows, water furrowing, digging corners. Expenses taken from Farm Account Book over 9 acres	10 15 0	1 4 3
fair time *before Christmas*, 3 horses; just break down the top with one harrowing iry time after *February* sets in, 2 horses; twice cultivate with *Barley Cultivator*, the land being in 8 feet ridges the horses may be kept *off the land*. Twice harrow ry harrows before the drill, 4 horses; drill 14 rows on 8 feet, 3 horses; light harrow er drill; draw up furrows, water furrow, dig corners, women to pick and clear the Expenses taken over 20 acres	18 8 6	0 18 5
EANS. Filling, carting, and spreading 16 loads per acre raw dung; ploughing, ; twice harrow, 4 horses; once, 2 horses before drill; drill 7 rows on 8 feet with ins, 4 horses; light harrows twice after, 2 horses; furrow plough, water furrow, dig Labour—picking and clearing round field. Expenses taken on 8 acres	12 0 4	1 11 3
EANS AND PEASE, filling, and carting 240 loads to heap; turning, filling and carting ls on the land; spreading, ploughing, 3 horses; water furrow *for winter;* dig corners ur round field; *Spring-work*, twice harrow, 4 horses; once, 2 horses; use *Barley tor* if necessary. Drill 7 rows with 4 horses; light harrow twice after, 2 horses; rrows, water-furrow, &c. Expenses taken over 12 acres	24 17 7	2 1 6
OATS. Break up *spring bean land* with Coleman, 6 horses, crossing with 4 horses, g such points, chisels or shares as will enter the ground well; twice harrow with s; roll with pair horse-roll; light harrow; horse rake, picking and burning, filling, , and spreading 14 loads per acre raw farmyard dung; plough, 3 horses; twice harrow, s; drill 12 rows on 8 feet; light harrow twice after; strike furrows, water furrows, cut ar round field. Expenses taken over 8 acres	15 10 2	1 18 9
IATS. Clean the *winter bean and pea-land* in the *Autumn*, but *don't break it*. Tillage ne as for *spring beans*. Expenses taken on 8 acres	12 2 9	1 17 10
land for sufficient *tares* for cart horses, colts and cows; take also what is required vide *spring feed* for ewes and lambs, and sow with Sutton's improved *Italian rye-grass*; rill come to the scythe or feed when the *tares* are done. Sow what *clean clover* is ient, and seed the rest down with *a mixture* adapted to the soil, and that will make a irm bottom, this will be the last to break up for roots. 2 horses roll, mix seeds for	Tare land preparation on 8 acres. 7 14 10	0 19 4½
drill, 2 horses; roll 1. Expenses taken on 10 acres	1 8 0	0 2 9½
:ns. 4 acres mucked before harvest, 18 loads per acre, long muck; filling, carting, and ling; mow and cut round field, plough the whole, 3 horses; water-furrow for winter. g and carting 80 loads to heap for remaining 4 acres; turning ditto back in a dry 3 horses; harrow once heavy drags, 4 horses; cultivate with 4 horses, *Barley Culti-* Filling, carting, and spreading on 4 acres; roll down, draw out and plough, 2 horses; 2 horses; harrow, 2 horses; burning and carting earth; mixing, filling, and carting re to field, 18 loads; drill, 3 horses; roll, 1 horse. Expenses taken on 8 acres	20 7 6	2 10 11
LAND FOR SWEDES AND HARDY TURNIPS. Plough as deep as soil will permit, ses, in *March or April;* harrow twice directly the land will work, and again in a ight; or use barley cultivator if the land will work without raising the sod, 3 horses; nanure on with distributor, and harrow in same time, before the drill, 2 horses, and ses; burning ashes, sifting and mixing manure, carting ashes home and manure to the ; drill, 3 horses; roll, 1 horse. Expenses taken on 8 acres	8 15 9	1 2 0
ASS FOR TURNIPS. Plough first time in *January or February*, 3 horses; water furrow; back in March, 3 horses; harrow twice with heavy drags weighted, 4 horses, when the will work. *Cultivate* across twice with Coleman's clod crush, 3 horses; harrow, 2 horses; 1 horse; women picking docks and grass; plough for crop, 2 horses; burning earth, g, and carting earth home, 1 horse; mixing, cart to field, preparing land for the drill, ate manure, 2 horses; harrow, 2 horses; roll, 1 horse; drill, 3 horses; light roll, m, Expenses taken on 8 acres	16 0 4	2 0 0½

folding is to persevere, but not to persist; recollecting that all the labour and attention expended on sheep is well bestowed, not only on them but in saving the hauling of roots home, and of dung to the field.

I will now take the crops year by year.

I commence with *wheat;* but my mode of preparation for it will be best stated in connection with the preceding crop.

Supposing the wheat-stubble to be there, I find that, on a strictly clay farm, I can grow on an average of seasons a much better quality, and a much larger quantity of BARLEY upon a wheat-stubble than after turnips or any root-crop; for whereas the difficulty of managing the root-crop, is such as to stand in the way of getting such land into proper condition for barley, after wheat ample time is afforded for the purpose. The way we proceed in preparing for the barley-crop is this:—In harvesting the wheat we leave a 6-inch stubble on the land; that is, we cut as high as we can with the scythe consistently with cutting the corn off clean. I find it advantageous not to turn in the wheat-stubble much before Christmas; the land being a sounder and healthier seed-bed for barley when not longer exposed to the wet.* We select a fair time for ploughing with three horses. We then break down the top by harrowing once, with two horses, in the first dry time in February. We twice cultivate with a barley-cultivator, a light implement that I have had constructed specially for this purpose, and this, which we use instead of the harrow, lifts the soil completely up, as deep as it has been ploughed. This requires four horses, as my land being in 8-feet ridges, the cultivators, drills, harrows, and other implements, are made to take a whole ridge. Having gone once over the ridge, we repeat the operation; but in the second instance we drive the cultivator in the opposite direction. This is the finest preparation I have yet known for barley upon clay land. The land being in 8-feet ridges the horses may be kept off it.† Taking the entire expense of horse and hand labour from beginning to end of the process, I find the total cost of preparing twenty acres of land for barley to be 18*l.* 8*s.* 6*d.*, or 18*s.* 5*d.* the acre; but I set a low price on my horse-labour, having some salt marshes close at hand, and a good run for the horses, which cheapens their keep considerably.

After barley come BEANS AND PEAS. For this crop we cart a good dressing of farmyard-dung, sow early, and hoe and weed frequently. I divide this course into three different classes—(1) winter beans, (2) spring beans, and (3) an early description of peas.†

The next course, that is the fourth year, is *oats following upon beans and peas:* and with the oats we lay down the land to clover. Some gentlemen may have thought that this work was overlooked, and wondered how I should bring it in; but I find that I have grown much

* I account for the difference in this way:—On tenacious soils, like mine, the land cracks prodigiously in the summer, and these cracks, if undisturbed, form watercourses and means of escape for the heavy autumnal rainfall: whereas by autumn tillage all these channels are stopped. At all events, I find that in practice the land broken up in autumn, comes up more sodden under spring cultivation than that which was broken up after Christmas.

† For details and cost of cultivation, see diagram.

better seeds after a good standing crop of oats upon my land than I ever did after barley and folding, and I can get my seeds up with greater regularity and certainty; therefore I seed down the oat-crop for clover.

The OAT-CROP again I divide into three parts, first, winter oats, of which I get in some in the autumn in order to make sure of some forward corn; then black Tartarian oats, a hardy productive kind for the spring; and lastly, some Canadian oats. I sow Tartarians after winter beans in March, put winter oats on the spring bean-land, and the Canadians on the pea-land, and change the ground every rotation. I dung for this crop and hoe for seeds.* When preparing for *spring oats*, after winter beans and peas, we clean, but *do not break*, the land in autumn, finding that it is advantageous to let the land lie for some time.

We have now got through the four crops of corn, which follow one after the other, thus:—Wheat, barley, beans or peas, and oats. I come next to the *first green crop or fifth year*, wherein we have clean clover, trefoil, cow-grass, Dutch clover, Italian grass, improved Italian rye-grass, besides the tares required for mowing. Apportion those crops according to your requirements, drill all the seed when you hoe oats between the rows of corn, and top-dress early Italian rye-grass with 3 cwt. of guano, one-half to go on in autumn and one-half in spring. Reserve land for tares sufficient to supply nag-horses, cart-horses, colts, and cows, and also to provide spring-feed for the ewes and lambs. Sutton's improved Italian rye-grass—the most reliable plant I have come across for many years—will come to the scythe or be ready for feeding when the tares are done. Sow what clean clover is expedient, and seed the rest down with a *mixture* adapted to your soil, so as to make a good sound bottom; this will be the last to break up for roots.* This is the land on which, as I have said before, our sheep will stand during the wettest part of the winter, our old clover-leys remaining unbroken till quite the spring of the year, and giving a firm run for the sheep when no other part of the farm would bear them. The mixture I sow is composed of trefoil, cow-grass, Dutch clover, and Italian rye-grass; my mode of sowing is this: I horse-hoe with Garrett's implement, and drill the small seeds between the rows of corn at the same time that the hoe breaks the surface; thus the weeds die and the seeds begin to live at the same time.

I come now to the sixth course—*roots following seeds*. I reserve the land which was in tares for mangold; the reason being that cutting these early tares for the use of horses, we at once cart on long manure, which is ploughed in immediately with three horses at a great depth, so that the land is often under a summer fallow in May. I follow the mangold with such roots as store well, and have a fair breadth of early white turnips.

I come now to the second division of the seeded or clover land, that is, the *land intended for swedes and hardy turnips*. I plough as

* For details and cost of cultivation, see diagram.

deep as the soil will admit of in March or April. At first I began by ploughing the land up earlier; but I found that by waiting until the water was going down in the spring of the year, my land came quicker for the root-crop than if I had turned it sooner, and it had received all the wet of the winter. I also found it healthier; and when pressed for a dry spot for sheep, I had these good, sound, healthy clover-leys to go to.* I think you would be surprised to see the clover-lands that I have just turned in for roots. Notwithstanding all the wet weather we have had this year, they ploughed remarkably well, and I am much nearer a turnip-crop there than I ever was by repeated ploughings during the ten years that I farmed clays in Suffolk.

I come now to the third division of the ley ground in the preparation for roots; that is, the *rye-grass land*, which was laid down for the ewes and lambs in the spring of the year. We plough up the rye-grass ley the first time in January or February, giving it more tillage than the rest, because Italian rye-grass gets tough and bunchy, and wants more dealing with than clean clover land.*

We are now arrived at the next course—the seventh year, or *green fallow*. We generally preserve a portion of mangold on the land: I have now 15 or 20 acres all stored on the land, for consumption upon it by the sheep. But we always run off sufficient to secure us in the long spring, that we may have food to give the sheep and cattle elsewhere. After the mangold has been removed, we plough as early as possible with three horses, and put in winter tares, if any more are likely to be required; but sometimes the land on my farm is so exceedingly stiff, that I let it remain through the winter without a crop, and then seed it down with winter tares in good time in the spring, and so fold it off in summer and prepare the land for wheat. The whole of the root course is now ploughed, and got in order for a summer green-crop as speedily as possible. As the sheep clear away the roots and fold off the ground, so we plough the land up in preparation for another green crop; and the most profitable one I have yet met with is rape, which we put in as the land is broken up with the same manure that we use for turnips. The successive sowings provide a succession of food for the sheep; the new green-crop is at once put into the mangold land for summer consumption, and the turnip-land comes afterwards. My earliest sowing of rape is in April, and I put plenty of manure; cultivate with barley-cultivator, four horses; harrow, two horses; mixing and distributing manure, two horses; drill, two horses; light roll, one horse. The expense of tillage in preparing for the summer green fallow after roots on eight acres is 6*l.* 12*s.* 4*d.*, or 16*s.* 6½*d.* per acre.

I have now to direct your attention to the *folding of turnips and the preparations for the same summer crop.* Break with Coleman as soon as the land is dry enough; let it lie and get thoroughly dry; then, after the first good rain, harrow well, and raise plenty of mould, and get the rape and mustard in to follow for the sheep. Cultivate with six

* For details and cost of cultivation, see diagram.

horses; harrow, three horses; roll, two horses; harrow, two horses; mix manure and distribute, two horses; drill, two horses; roll, one horse. Expenses, taken on eight acres, 4*l.* 11*s.* 3*d.*, or 11*s.* 5*d.* an acre. This comes to rather less than the mangold land, because it is done later in the spring, when the land works easier.

The next point I have to deal with is *the bare winter fallow*, where a piece of land is not cropped at all. We plough that with three horses at a convenient season in winter, and put in winter tares in February: cultivating as for rape on mangold land. The expense, taken on eight acres, is 7*l.* 13*s.*, or 19*s.* 1½*d.* per acre.

The process of feeding off the summer green crop is of course the *preparation for the first year's crop of wheat.* The expenses, as shown in the diagram, amount only to 1*l.* 4*s.* 3*d.* per acre—a very important reduction on the usual cost of preparing for the wheat-crop on heavy land farms.

These, then, are all the details of my system of management. Its principal feature is—that between two succeeding crops, whether corn or otherwise, ample time is allowed to prepare a good weather-made surface for the seed which is next to come. Another important feature is that the root-crop we have raised at so much expense may be consumed at the precise time when it is most profitable and convenient to do so. Under the old system you know the spring-corn is hanging over head, which must be got in by a certain time and consequently the roots must be got rid of—as they say in Suffolk, the roots must either be "puddled in" or "muddled off" the land; but by this course of cropping I avoid that difficulty, and I give myself sufficient time to consume a large amount of green crop upon the land when it will bear sheep.

In reply to Lord Berners,

Mr. Hughes said he drilled as much rape as he did of swede turnips —about two pints per acre, with about one pint of mustard. He commenced drilling it in April, went on until June, and mixed it all the time. He looked upon mustard as useful, but rape was the plant; indeed, that which he grew after turnips last year, upon the stiffest clay he had ever seen, was of such enormous bulk that this year he had taken his turnip platform into the field, put on the chaff-cutter, and cut up the whole crop for the sheep. The wages he paid were 10*s.*, 11*s.*, and 12*s.* a week to the labourer, and 8*d.* a day to the women; but they were about to be raised. The horses cost only 1*s.* 6*d.* a day; but he had the advantage of having a considerable run for them in the summer, when he got rid of them for a long time. He hired his land five years ago, at 7*s.* an acre, and the rent was an increasing one. He drilled his oats in rows of 8 feet, and he hoed once before putting in the seeds.

In reply to Mr. Thompson and others,

Mr. Hughes said, that, in growing wheat after two successive green crops had been fed off, the wheat was not too heavy, if only planted early and thin. He used 1½ peck of wheat and 3 bushels of oats to the acre. The number of sheep he kept varied with the state of the markets. Until this year he had generally kept Dorset ewes, which

he fatted with their lambs; but as there was a prospect of mutton being dear, he had this year fatted wethers instead, so that he was saved trouble with ewes and lambs, and enabled to feed rather more wethers than ewes, because provision had to be made for the wants of the lambs. He had a good deal of old pasture, but the sheep never saw it till after the clover-lands were ploughed in spring, In a wet spring the sheep were driven to a dry pasture till they could go to the turnip-lands again. He kept a great many colts and pigs, but no bullocks at all.

Mr. J. Howard asked what Mr. Hughes did with his horses at Michaelmas, and during the autumn months, seeing that he left the clover-ley until spring, and the fallows untouched until January, or later in the year?

Mr. Hughes said that he put in winter beans and winter oats, cleaned and tilled the bean-land, and carted off all that was required of the mangold, and some early turnips for the ewes and lambs in the spring. He did not use so many horses under this system as he formerly did; and he had had no idle horses in autumn since he had farmed clay-land.

Mr. Howard was sure that he had not in the spring, when the great bulk of his work appeared to be done. He agreed with Mr. Hughes as to growing tares instead of roots on strong land. For many years that had been the custom in Bedfordshire, and a better crop of wheat was got after it. His experience of autumn cultivation, however, was, that the sooner after harvest clay-lands were broken up the better; and he suggested that if Mr. Hughes got a steam-cultivator on his clay-land he would have some advantage in breaking-up in the autumn, and would not find the land so tenacious after treating it in that manner; nor, indeed, would it be necessary to put it up in 8-feet bands or ridges, as clay lands when broken up at a great depth and laid flat require no furrow.

Mr. Hughes would be only too glad to find that the steam-cultivator could be used with advantage on such ground as the Hampshire hills, with their stiff clay soil. He admitted that he got out of the 8-feet ridge whenever he could; but his chief reason for maintaining it upon his farm was that his land was so dependent on the seasons that by this means alone he was often enabled to snatch an opportunity to pop on his harrows and drills, and put in his corn, the horses walking in the furrows, whereas, if they were walking on the flat surface they would make a furrow with their feet.

Mr. Howard thought Mr. Hughes entirely wrong in the conclusion that steam was not adapted to hilly land. On the contrary, the more hilly a country was the greater would be the advantage of steam, for the simple reason that such land was more difficult to cultivate with horses, and there was a larger margin of profit on the employment of steam. Where a horse could go, steam could go there better.

Mr. Thompson said that he had some particularly heavy clay-soil and he found that the great thing was to have it as dry as possible: it then became mellow, and more easily worked with less labour. He thought that by ploughing in autumn they would generally secure a

dry seedbed; whereas, if they left the land unemployed until the spring, there was great uncertainty about it; in the North of England particularly they could not get it ploughed early enough to put in the seed.

Lord BERNERS, in proposing a vote of thanks to Mr. Hughes, said he could go a great deal further even than Mr. Howard in recommending the use of the steam-cultivator and steam-digger. He had had many years' experience of their use; and scientific gentlemen, when they visited his farm, said, "If you can work a plough up and down these hills on this strong tenacious clay, you can do it anywhere." By cultivating the old clover-leys and everything he could get at in the autumn, the land was now in the most perfect state possible. The greater part of it only required to be further harrowed down once, and to have the cultivator once passed through it, to fit it for all business purposes. Some years ago he adopted the Norfolk system known as the ten-furrow work, and had all his implements made to fit; so that in ploughing, drilling, and other operations, the horses trod only in the furrows, and from seed-time to harvest never trampled on the land. He now found from experience that by deep draining and deep cultivation, especially autumnal cultivation, he had no longer the slightest occasion for ten-furrow work. And there was this further advantage, that, whilst formerly upon his strong lands he could not work the reaper, he could now cut all his corn, beans, and everything with that implement in the most effective manner. To show the benefit of steam-ploughing more particularly, he might mention that just before last harvest he took a farm into his own hands, 80 acres of which were in the worst possible state, overrun with twitch and almost every thing that was bad. Having no horses to spare, he sent his steam-cultivator on to the land, and before Michaelmas arrived he had every acre quite clean, some of it having been cultivated three and four times over; the application of the rotary-harrows of Ashby of Stamford helped materially in getting the land into perfect condition. Now, if he had had *any* number of horses, it would have been impossible for them to have broken up the land, for it was as hard as the road.

The vote of thanks having been put, Mr. HUGHES in reply said he was by no means opposed to steam cultivation, but looked forward hopefully to a time when he should be able to use it economically, even on his heavy clay farm.

Weekly Meeting of Council, May 11, 1864. Mr. RAYMOND BARKER in the Chair. Lecture by Dr. AUGUSTUS VOELCKER.

THE ATMOSPHERIC NUTRITION OF PLANTS.

Dr. VOELCKER said:—Theoretical inquiries, as to the nutrition of plants, may at first sight appear of very little practical interest, but it will be found on reflection that questions of vital importance to the farmer depend very much on their accurate solution.

Within the last year or two the controversy as to humus has been

revived under the new name of the vegetable mould theory; an serious apprehensions are entertained by many intelligent, educate people that, by degrees, we may relapse into a condition wherein i will be difficult to grow remunerative crops on the soils of England. Such apprehensions could not possibly have been enter tained had correct views existed as to the way in which plant take up their food. The old humus theory has been successfull annihilated; indeed, after Liebig's forcible writings in exposing it fallacy, it is impossible for it to be maintained. Yet up to this day readers of respectable journals are addressed in lengthy papers, o the so-called vegetable mould theory, which are anything but satis factory to those acquainted with the recent progress of scientifi research in relation to the process of vegetable nutrition.

In dealing with the subject of the atmospheric nutrition of plant very little can be said that is original, or of very recent date; fo within the last five or six years no very striking discoveries bearin upon the subject have been made. Our knowledge, however, in th absence of any material additions, has become more definite an positive, so that we can speak with greater certainty on matters which we had formerly but indistinct ideas.

The atmosphere is a mechanical mixture, chiefly of two gases oxygen constituting about 21 parts in round numbers, and nitroge 79. Mixed with these two gases are carbonic acid, ammonia, an nitric acid in certain small proportions; water is also invariabl present in the shape of vapour. It is interesting to notice th nitrogen, the most conspicuous constituent of the atmosphere, do not take any direct part in the nutrition of plants, but it is pr cisely those small quantities of matters for a long time overlooked-viz., ammonia and nitric acid, that are most active and influential i the process; for notwithstanding some experiments recently made i France by M. Ville, it has been decisively shown by M. Boussingaul in France, and Messrs. Lawes and Gilbert, in England, that nitroge as an element of the atmosphere, is not assimilated. Oxygen, th other great constituent of the air, has an influence rather indire than immediate in the nutrition of plants. Plants, through the m dium of their leaves, restore oxygen to the atmosphere, and therel keep up the balance which it is so necessary to maintain, but whi is continually disturbed by the removal of the oxygen by anima for the support of respiration. We have abundant proof that is chiefly the carbonic acid of the atmosphere that supplies th carbon of plants, or, in other words, the great bulk of all vegetatio It is calculated, indeed, that at least three-fourths of the dry su stance of plants is derived from the carbonic acid of the atmosphe During the daytime, the absorption takes place continuously; an no sooner have the leaves absorbed carbonic acid than they set abo the work of destroying its form, assimilating the carbon, manufacturi t into starch, gum, sugar, and other combinations found in all vegetab productions, and at the same time throwing off the oxygen so as restore the balance.

It is by some supposed that the decomposition of carbonic ac

takes place only in direct sun light; this, however, is a mistake, for the reflected rays and diffused light are equally as capable as direct light of producing this effect. As carbonic acid is the chief source whence plants derive their carbon, the question naturally arises:—Is there sufficient in the atmosphere to meet all the requirements not only of wild but cultivated plants? At first sight this atmospheric supply would appear to be anything but sufficient for the purpose, for according to De Saussure's accurate and precise determinations of the amount, there are only about four parts of carbonic acid in every 10,000 parts of air. These determinations have been confirmed by many other observers, and it is therefore not far wrong to say that every 10,000 parts of air contain from 4 to 5 parts of carbonic acid. This is a small relative proportion, doubtless; but when we consider the enormous volume of the atmosphere, the perfection and beauty of the apparatus which plants are provided with for absorbing the carbonic acid diffused around, and constantly wafted in all directions towards their leaves—when we further consider that in some instances plants arrive at maturity which have had no other source from whence to derive their carbon, we are forced to conclude that the atmospheric supply is sufficient for most plants. This idea does not preclude another, that carbonaceous matters in the soil are most essential for certain purposes; but as a rule it is the carbonic acid of the air, and not the carbonaceous matters in the soil, which supplies carbon to plants.

Observations on the wants of plants have been somewhat enlarged of late years, and I believe I am not wrong in stating that whilst some plants entirely rely upon the carbon they find in the atmosphere, others are greatly benefited by carbonaceous matters, sometimes termed humus, which it is desirable should be present, in the soil. I believe that cereal crops are not dependent in any great measure upon any carbonaceous or organic matters in the soil; whilst root crops, turnips, mangolds, and others are materially benefited by the carbon present in the humus. Whether it is, however, in the shape of prepared organic matter that the humus acts usefully as a source of carbon to roots, or whether it is because the humus in the soil is continually undergoing a change, and producing carbonic acid in the very soil which grew the roots, I leave for the present undecided. Indeed, we have no very distinct experiments, nor are they easily instituted, to show that organic matters as such are taken up by plants; but this is certainly known as an important fact, that the air in the soil itself contains a very much larger proportion of carbonic acid than the atmosphere resting upon it.

Some years ago M. Boussingault made some very careful experiments upon the amount of carbonic acid which occurred in soils, and he found that whilst the atmosphere resting upon the soil only gave 4 to 5 in every 10,000 parts, the air in sandy soil recently manured, contained 217 parts of carbonic acid in every 10,000 parts. Shortly after rain the air from the same soil was again analyzed, and was found to contain as much as 974 parts of carbonic acid; evidently showing that the wetting of organic matter, and the rapid decomposi-

tion which had taken place in it through contact with the porous earth, had led to the destruction of the humus and the formation of large quantities of carbonic acid. This throws some light upon the very startling growths sometimes noticed, especially in the case of root-crops. The rapid start of young turnips after a good shower of rain, on well-dunged land, arises from the rapid production of carbonic acid in the soil; but we look in vain for this result in soils not properly cultivated.

Plants, and root crops especially, not only take up carbon through the medium of their leaves, but apparently also in the shape of carbonic acid in very large quantities through the medium of their roots; it is especially useful to furnish root crops at an early stage of their growth with matters that supply carbon in the shape of carbonic acid. Boussingault shows that whilst in calcareous soil there are in 10,000 parts of air only 87 of carbonic acid, and in heavy clay soil only 66, there are in pasture-soils as many as 179 parts of carbonic acid to every 10,000 parts of air. Thus it will be seen that in all these instances, the quantity of carbonic acid in the soil is very much larger than the quantity resting immediately above it.

In the next place I have to direct attention to atmospheric ammonia, which is, perhaps, the most important constituent of the atmosphere. For a very long time this was entirely and very pardonably overlooked, since the quantity is so small that it cannot be determined with anything like precision, and it is necessary to have recourse to an examination of the rain or dew to ascertain anything like an approximation to the truth. Determinations of the amount of ammonia and nitric acid in rain-water have been made by Messrs. Lawes and Gilbert, and by Professor Way, and in France by M. Bineau, and also by M. Boussingault, who has done so much for the progress of scientific agricultural chemistry. According to M. Bineau, 1,000,000 parts of air contain only about ·2 of ammonia; the amount varying in different seasons. According to these researches, the rain which falls annually upon an English acre carries upon the land about 22 lbs. of nitrogen. This quantity includes the nitrogen which occurs in rain-water in the state of ammonia, as well as that in the form of nitric acid. Twenty-two pounds upon an acre is but a small amount,* and we have to consider the very important question whether this quan-

* In the course of a subsequent lecture Professor Voelcker qualified the statement here made by explaining that he quoted from Baron Liebig's 'Laws of Husbandry' when he assigned these proportions to the ammonia in rain-water. Dr. Voelcker then added, "I find that the figures do not correctly represent the average amount of ammonia which is present. I mentioned 22 lbs. as the amount of ammonia, but 14 lbs. would be nearer the mark.' This correction is important in reference to the consideration whether atmospheric ammonia is sufficient to meet the requirements or wants of the plants. If it be stated to be half as much again as it actually is, that of course makes a difference in our views respecting the propriety of supplying ammonia in the shape of manure, or leaving plants to find their supply in the atmosphere." The amount of ammonia in rain-water, no doubt, varies considerably in different localities, and it is, therefore, not easy to give a fair average. On the whole, however, he thought 14 lbs. represents more nearly the average of ammonia in rain-water than 22 lbs.

tity is sufficient for the requirements of plants. M.M. Bineau and Boussingault pursued a very extensive series of experiments bearing upon this matter, and from them it followed that whilst some plants may find a sufficient quantity of nitrogen in the shape of ammonia or nitric acid in the atmosphere to enable them to grow luxuriantly, others are decidedly benefited if, in addition to the atmospheric ammonia or nitric acid, they are supplied through the medium of the soil with either ammoniacal salts or nitrates, or organic matters producing, on gradual decomposition, either nitric acid or ammonia.

It is generally admitted that cereal crops are more benefited by ammoniacal fertilizers than those commonly termed green crops. It is interesting to inquire as to the reason of this distinction. It would seem at first sight that green crops are more capable than cereals of assimilating atmospheric ammonia or nitric acid, because of the greater development of the leafy part. But it is only under certain conditions that root-crops can be thrown entirely upon atmospheric resources for their food. When plants like turnips grow rapidly, it generally happens that the soil contains a considerable quantity of organic matter, which favours the development of leaf; but when for some reason or other a deficiency of organic matter occurs, as is often the case in sandy soils, ammoniacal matters are supplied with great utility even to root crops. There are, however, other instances in which those manures are entirely wasted. How necessary it is then that we should have precise and accurate observations upon these important matters, and that we should not be satisfied with general statements not unfrequently made by men who, though eminent for scientific research, are deficient in the qualifications of mind that would entitle them to become the guides of practical men! Many theories are extremely beautiful, simple, or interesting to all who take an interest in the progress of farming, but, from want of sufficiently minute attention to details, the farmer in his application of them may be seriously misled. The sum and substance of my observations is, that whilst we know that under certain conditions which have as yet to be still more minutely examined, and for certain crops, we have a sufficient atmospheric supply of ammonia and nitric acid, there are other crops, and more especially cereals, which do not grow with sufficient rapidity to be remunerative without the addition of nitrogenous manures to the soil.

Upon the great influence of water, whether in the shape of watery vapour, dew, or direct rain, as necessary food to plants, I need not dwell, but I pass on to another effect of the atmosphere on vegetation.

The observations I have hitherto made all tend to show the *direct* influence which the atmosphere has in the nutrition of plants; but there is another part which it plays in the growth of vegetables, which, though it may be called the *indirect* one, is so great in its effect, that we may say positively that all soils which are not penetrated by air are unproductive, no matter how much food they may otherwise contain. Cases are constantly brought under my notice, of soils, sent for examination, which are characterised as unproductive, but turn out to contain an abundance of all the mineral constituents

required for the growth of plants, and require only to be thoroı penetrated by the air in order to furnish an unlimited quantity of The atmosphere really exercises a most beneficial effect both o inorganic and organic constituents of the soil. I have allude the large quantity of carbonic acid present in the air which exi the interstices of the soil, but this supply cannot be produced u the air finds its way into the soil. An excess of organic matt the shape of decaying roots or leaves is so injurious, that whe exists in soils which are not easily penetrated by air it would be better for it to be burnt altogether away. At first sight this appear to involve a great waste of useful material in clay-soils if the beneficial effect be greater than the sacrifice, it can sca be called a waste; for although serious doubt has been entert respecting the utility of burning, some soils are with so much diffi penetrated by air that burning is the only way of destroyin organic matter, which when present in an imperfectly aërated dition is rank poison to most cultivated plants. It is certain th destruction of sour humus, as it has been called—though in a che point of view all humus is acid—has been attended with most ficial effects, and when recourse cannot be had to proper mea aëration, this destruction has been practised with very great a tage to the succeeding crop, even if, as in the case of turni would be otherwise benefited by the presence of carbonaceous m in the soil. When, however, we can effect the destruction of oı matters by the atmospheric oxygen, the practical result, I ha doubt, will be greater; for not only does the air, and more espe the atmospheric oxygen, act upon the organic matters in prod carbonic acid, but it also has an important effect upon them ir ducing nitrates in the soil.

The quantity of organic nitrogen in the soil is very large. years ago I made an experiment with the view of ascertainin much nitrogen was present after the clover crop had been ren and I ascertained that, taking an acre as the experimental aı was equivalent to rather more than the amount of nitrogen pres 8 cwt. of Peruvian guano. It has been found that the clover c the most excellent preparation for the succeeding wheat, and known now as a fact, that after growing a good crop of clover large amount of root is left in the soil. It cannot be maintaine the nitrogen, to the whole extent I have stated, will be availal the shape of nitric acid; yet, if only one half becomes so ava the reason will at once be seen why a good crop of clover is s invariably followed up by an abundant crop of corn. But in that the beneficial effect should take place, it is most essentia the soil should be penetrated by the air, and that after grow good crop of clover immediate steps should be taken to work th for the better the soil is worked by proper machinery the soon clover-ley is broken up, the sooner atmospheric air enters the so more rapidly the nitrogenous constituents of the root are dest and the more abundantly are nitrates formed in the soil. I

examined soil that had been well penetrated by air, without finding large quantities of nitrates present.

So much with regard to the indirect influence of the atmosphere in the nutrition of plants.

The indirect influence of the air on mineral matters, especially in clay-soils, is also most important. Clay-soils frequently contain an abundant store of mineral food, which is as essential as atmospheric food to the growth of plants; but in many cases it is so locked up that it is of little or no avail to the growing plants, and it is only when the air thoroughly penetrates the soil that it becomes available. It is by the introduction of atmospheric oxygen and carbonic acid that many mineral compounds entering into the double silicates of alumina are gradually decomposed, and the alkalies, lime, potash, soda, &c., are rendered assimilable by plants. In consequence of this remarkable action, the surface of the soil becomes more porous and powdery; and a proper aëration reduces a stiff clay-soil into fine earth, at the same time producing the food so much wanted for the growth of the plant, and that condition which enables the plant to avail itself more abundantly of atmospheric food; for the more porous the soil is, the more readily it absorbs ammonia and carbonic acid from the atmosphere. The atmosphere supplies an abundant store of food in a direct way to all plants; it also supplies nutriment in an indirect way by operating upon the organic matters of the soil, producing carbonic acid and nitrates. It operates upon the mineral constituents of the soil, rendering them soluble, and therefore available as food for plants; and lastly, while effecting all these beneficial changes in the soil itself, it materially improves its mechanical condition, whereby it acquires the power of availing itself more perfectly of the food existing in such great abundance in the atmosphere.

Discussion.

Mr. Frere: You tell us that rain furnishes 22 lbs. of ammonia and nitric acid to the acre. You have also spoken of the nitrogen in the roots of an acre of clover being equivalent to 8 cwt. of guano; for the purpose of connecting the two statements, will you also mention the number of pounds of nitrogen in 1 cwt. of guano?

Dr. Voelcker: Good Peruvian guano contains from 14 to 15 lbs. of nitrogen to the cwt. I mentioned only one example of the quantity of nitrogen in roots and other vegetable remains that are left in the soil; but it of course varies. I am at present engaged in an inquiry into the growth of clover, and I shall follow it up by endeavouring to ascertain how far it is useful as a preparation for the wheat crop.

Mr. Frere: I gather from these premises that a dressing of 4 cwts. of guano would produce about 60 lbs. of nitrogen in different forms, or three times as much as the rainfall will produce.

Dr. Voelcker: Exactly so.

Mr. Holland, M.P., in allusion to the large amount of nitrogen in the roots of clover, said that in growing and managing the clover crop, it was desirable to pay as much attention as possible to increasing the

roots. If the heads only were worked off, the stems were uninjure the plant continued to grow, and a large amount of root was formed but if the clover was fed off, the plant was more or less injured not killed, and no root was formed. This in considering the effect the clover crop upon wheat would be of very great value.

Dr. VOELCKER said: The question had already occupied his atter tion, and he found that after two years' clover-crop, leaving the fir year's crop standing for seed, more nitrogen was actually obtaine than when the clover was immediately fed off. The explanation wa that roots develope themselves much more perfectly when the clove plant is allowed to grow without being checked, than if subjected t the nibbling tooth of the sheep. As the question was one of grea practical importance, he hoped that in event of it being necessary t extend his observations and experiments, members of the Society i different parts of England would assist him by forwarding hi specimens of clover from different localities.

Mr. COLEMAN asked whether the comparative injury from feeding as against mowing, in reference to the wheat crop, would not depen in a great measure upon the method of feeding; whether the pla which he believed was most economical as far as the animal wa concerned, viz. that of passing rapidly over the surface, allowing th crop to attain a height of 6 or 8 inches, and then at once feeding of giving one day say to one spot—would not answer the same purpos as allowing the clover to run up to seed? It might be gathere from what Mr. Holland said, that mowing a crop would produc more of root than feeding off. That, however, was hardly consisten with his experience. If the crop was continually gnawed down, the could readily understand that, like a tree constantly topped, it woul not produce root growth; but he should like Dr. Voelcker's opinion a to whether, supposing it were fed off in the way he had suggested i the case of poor but not clay-soils, they might not expect a bette result.

Mr. FRERE observed that it had been the immemorial practice t plunder the pastures for the advantage of the rest of the farm; but, o the other hand, it was said that the pastures were the landlord' bank. This was a paradox which had an important bearing upon th question under their notice.

Dr. VOELCKER (in acknowledging a vote of thanks proposed b Sir John Johnstone, and seconded by Mr. Holland, M.P.) said h could not form any precise opinion as to the point raised b Mr. Coleman, but he proposed to make experiments with the view o ascertaining the amount of produce, and what was left in the groun after treating a piece of clover in various ways. With respect t Mr. Frere's question, he could only hope that those who looke upon pastures as a bank had some other bank as well. He ha generally found that those who looked upon pastures as a bank fron which they could continually draw, were not men who were very wel to do, and certainly, if they were tenants, were of no great advantag to their landlords.

Meeting of Weekly Council, Wednesday, April 23rd. Lord Feversham in the Chair.

The subject of Agricultural Education was introduced by Mr. Holland, M.P., who, after a few introductory remarks, proceeded as follows:—

My Lord,—We are all agreed on the necessity of something being done in the way of education for the agricultural class. In general the subjects for discussion here take two or three different phases, according to the nature of the land, the climate, and the latitude; so that, in matters of agricultural practice, there are different views arising out of these circumstances; but education is a subject in which we all feel an interest, but which we hardly know how to handle, in consequence of our not having any particular system connected with the agricultural body. A few years ago the question would not have been mooted in this Society; but the growth of civilisation, the way in which man is now forced to exert himself, whatever may be his social position, and the manner in which he has to compete with his fellow man, require that no class should be backward in the acquirements of the age. As illustrating the question of education in connection with agriculture, I would refer to the answer of an engineer of some repute in connection with this Society, who, when asked how a young lad should be brought up for the purpose of becoming an engineer, replied, "Send him to King's College, or to some other large public establishment of that nature." Then came the inquiry, "What do they teach of engineering there?" "Never mind," was the reply: "don't think at present of his future profession; think only of his having a large groundwork, a broad basis for a good general education." The same advice would apply to the early education of a member of the agricultural body. The fact is, that whatever our ancestors may have done in the shape of education was voluntary on their parts; it was owing to the peculiar habits or tastes of the individual if he became an educated man; but now education is a necessity, and the only question is—How shall the want be met? In connection with this subject of education, everybody ought to read a pamphlet by the Rev. J. L. Brereton, Prebendary of Exeter Cathedral,* who has not only done great service by the manner in which he has made known the wants of the middle classes, but has gone practically to work, and, through his position and peculiar qualifications, has been able to make the public, and those who have power and authority in his own county, take an interest in working out practically the views which he has submitted to them.

Education has been quaintly declared to be the placing of the growing human creature in such circumstances of direction or restraint as may make the most of him. It is the machinery for furnishing him with such information as will be practically serviceable to him in future life. In considering the question with regard to the farmer

* 'Education as connected with Agriculture.'

we must remember that there are three classes connected with land: the landlord, the labourer, and the occupier. Now the rep of different public officers in this country show that the intermed class—that of occupiers—has been sadly neglected. Mr. Bellairs, of the Inspectors of Schools appointed by the Privy Council, says:

"I am afraid that in my district (that is Gloucestershire, Worcestersl and Warwickshire), there are few instances of schools for farmers, small tra men, artisans, and others of that class, and yet it would be difficult to men any description of school that is more important. There is no class of soc so imperfectly educated, or whose opinions are so crudely formed."

Mr. Brereton also, speaking of the wants of the same class, says

"The comparative deficiencies of middle-class education in England ma attributed to the single fact, that neither in the development during century of the higher system" (that is, the system of public schools, coll and Universities for the wealthier classes), "nor in the establishment of lower" (which has reference to the State education given to the poorer cla of which, by the way, the large body of occupiers of land, as well as middle classes, are the chief supporters through having to pay the rates), " there as yet been provision made for the large intermediate class who neither aspire to the former nor condescend to the latter. There are, ind many advocates for so extending these two systems as to embrace all the u middle class in the educational system of the gentry, and to absorb remainder in that formed by the help of the State for the labourer. It is still an open question, though lnot likely ong to be so, whether public opi will acquiesce in the permanent establishment of those subsidiary exam tions which the Universities have recently undertaken for the middle clas whether it will adopt the proposal to establish, in connection with the diffe counties, a new educational system with its own public schools, colleges, University."

The great mass of the middle class are without any means obtaining an education commensurate with their wants. Referrin this, Mr. Brereton continues:—

"In either case we may hope that a standard will be gradually fixed for general knowledge and for special studies, which will remove the exis uncertainty of object and irregularity of method, which are equally inju to the teacher and the taught, to the school and the home."

Then, alluding particularly to the farmer, he observes:—

"The effects of such a definite standard upon the English farmer's fa can hardly be overrated. When once it becomes recognised as the rule, all the sons of the family should complete their education by obtainir degree, the habits of the household would be regulated accordingly; and nere necessary arrangements for study would open in the seclusion and juent leisure of the farmer's home prospects of domestic order and happi iitherto almost unknown. Such an object alone, without reference to neans of its attainment, would insure this. For equally the holidays of schoolboy, the vacation of the collegian, or the daily pursuits of the h student would have this effect, extending also indirectly to the female mem of the family."

Such is the farmer's connection with the large middle class; the section of that class to which immediate reference is now mad the agricultural section, in dealing with which the great diffic

comes in that we hardly know whether the machinery exists for bringing into play all that can be requisite as speedily as the present generation requires. That there is a demand for it, I think there can be no doubt; but how is the demand in this section of the great middle-class to be met? During the period boys are at school general education of a public nature is all that is required. The difference between a public and private educational system is this, that the public system, being, as it were, public property, lays itself open to the approbation or disapprobation of the class requiring it for its own benefit; and at the same time, in connection with public education, a certain amount of stimulus is applied in the shape either of scholarships, prizes, or some particular mode in which honours are bestowed, giving to the individual receiving them a certain status, and, if the examinations be what they ought to be, an opportunity of displaying what there is in him. I think myself that, in the case of the children of agriculturists the nature of the education ought to be public, like that of the children of other sections of the middle classes, but that something more is also wanted. While at college there ought to be some connection between the practical working of the land and the future farmer. And here is one of the difficulties with which we have to contend. Mr. Grey, of Dilston, in the course of a speech which he made in the north some time ago, said:—

"The time has gone by with too many of us to profit by the improved education which the present state of society requires and affords; but allow me to remind such of you as have the responsibility of being parents, of the duty incumbent upon you to educate your families so as to fit them for taking a respectable position in life. It is the best patrimony which you can bestow upon them. A liberal and judicious course of education is the foundation of future acquirements; it opens up the sources of knowledge, and gives vigour and opportunity of expansion to any peculiar tendency of intellect which the mind is disposed to. Without it no man need expect to keep pace with the movement of society, or to make his way in arts, manufactures, or even agriculture—to which some knowledge of chemistry and the natural sciences is indispensable."

Having done with education as connected with agriculture, we have next to consider agricultural education, based upon the broad foundation of general education which is to be obtained at one of the public institutions, of which I hope, through the exertions of Mr. Brereton and others, and the example set us in the county of Devon, we shall soon see many scattered over the country. Mr. Wilson, of Edington Mains, the author of 'British Farming,' gives his opinion with regard to the rising young farmer in the following terms:—

"The mere possession of capital does not qualify a man for being a farmer, nor is there any virtue inherent in a lease to insure his success; to these must be added probity, knowledge of his business, and diligence in prosecuting it. These qualifications are the fruits of a good education in the fullest sense of that term, and are no more to be looked for without it than good crops without good husbandry."—"But the great difficulty at present lies in finding appropriate occupations for such youths between their fifteenth and twentieth years. In many cases sons of farmers are during that period put to farm-labour. If

they are kept steadily at it and are made proficient in every kind of wor formed on a farm, it is a good professional training as far as it goes. The common one—at least as regards the sons of the larger class of farmers—consists of loitering about, without any stated occupation, attending fai markets, and probably the race-course and hunting-field, is about the absurd and pernicious that can well be imagined. Such youths are re be pitied, for they are neither inured to bodily labour, nor afforded the b of a liberal education. It need not surprise any one that such haple often prove incompetent for the struggles of life, and have to yield their to more vigorous men who have enjoyed the benefit of bearing the y their youth. Unless young men are kept at labour, either of mind or until continuous exertion during stated hours, confinement to one plac prompt obedience to their superiors, have ceased to be irksome, there is hope of their either prospering in business or distinguishing themselves i profession. Owing to the altered habits of society there is now less like than heretofore of such young persons as we are referring to being subje that arduous training to bodily labour which was once the universal pr and hence the necessity for an appropriate course of study to take its pla "It is also common for such youths to be sent to Edinburgh for a wi two to attend a class of agriculture, and perhaps also of chemistry a veterinary college. This is well enough in its way, but yet there is wan it an adequate guarantee that there is real study—the actual performa daily mental work."—"After enjoying the benefits of such a course of tr as we have here indicated, young men would be in circumstances to deri advantage from a residence with some experienced practical farmer, or tour through the best cultivated districts of the country."

Again, Mr. Morton, in a lecture which he delivered at the Agricultural College, laid down these three points as essentials young farmer:—1st. That he should have practical skill; 2nd he should have business tact; and 3rd, that he should have a l and scientific education. Mr. Morton showed that, if a man had practical skill, he was little better than a labourer; if he had bu tact, he might not only be a labourer, but become a manager of a but that, without having, in addition to capital, a liberal and sci education, he was not fitted for holding a large farm in the p day. In this I thoroughly agree; but the difficulty is to indu farmer to spare his sons for additional education after they ar sidered to have left school; and the only way in which I imagi can be encouraged to do so is by having a portion of the expen on a lad repaid him by his obtaining a scholarship or prizes tha partly support him either at some educational establishment connection with a large farm. Now there is a want of all this, is one of the reasons why a committee of this Society has been re appointed. But we must remember that the duties of the com are limited to an inquiry into the manner in which the Royal ltural Society of England can assist those who are employ taining their living from the land; it cannot take up the uestion of the general education of the farmer. Our discu herefore, has nothing to do with the operations of the comm though, from what I know of its members, I dare say they more or less take the view which I am advocating, and be very make themselves acquainted with the opinions of the gentl assembled.

My views are these: That, following the example set us in Devonshire, we ought to do our utmost, not as a society, but as members of the agricultural class, to establish a system of public schools throughout the country as opportunity presents itself; that whilst the farmer's son is availing himself of the advantages thus offered, we ought to give him encouragement, by showing him that if he will but exert himself and bring out the talent that in him lies, he will gain honours and attain a status. And then we ought to follow that up by enabling those who have gained such honours further to make themselves perfect in their profession by having the advantage of attending where a scientific education is bestowed, or studying the practice upon a farm. This is the only way in which we, as an agricultural body, can work until the time comes, as I hope and trust it will, when, from the benefits accruing to the sons of occupiers of land who, through their own and our exertions, have been enabled to obtain a better education, or an education from which they are now entirely shut out, agriculturists themselves will step forward and join us in the great work of improving the educational condition of the farming class of this country.

At the conclusion of Mr. Holland's address,

Sir Edward Kerrison, M.P., said he was sure they would all thank Mr. Holland for the able manner in which he had introduced a subject that had been kept in abeyance much longer than it ought to have been by the Council of the Society, seeing that, according to their charter, it was one of their functions to encourage the education of the agricultural classes. Mr. Holland had mentioned the name of Mr. Brereton and his successful exertions. He (Sir E. Kerrison) had visited that gentleman's school, and had there seen the pupils, consisting chiefly of the sons of agriculturists, maintained and educated at a cost so reasonable as to be within the means of almost any farmer of a tolerably sized occupation, and some of these pupils had since passed the only test hitherto existing for the middle class, viz., the Oxford and Cambridge middle class examinations. A conversation which he had had with Mr. Brereton led him to consider whether efforts for the improvement of the education of the middle class should not be made in so general a way as to provide not merely an education for particular sections of that class, such as the agricultural, but for the whole middle class of the country; for Mr. Brereton's remark was undoubtedly true, that in many instances the sons of farmers were desirous of going into commercial life, whilst the sons of commercial parents were often desirous of becoming farmers. Consequently, the training in any school, to be beneficial to all, should be general; for it was well known that there was no limit to the trade of the country, but there was a limit to the land, and although year by year, owing to increased knowledge and energy, the produce of farming might be augmented, yet, excepting in a few instances, where fresh land was brought into cultivation, farms could not be increased in number. On the contrary, the tendency of the present time, and he regretted it, was to do away with small farms, and thereby reduce the number of

occupations open to the sons of agriculturists. For this reason it \
the more necessary that the Council, in any system of education tl
encouraged, should be careful not to give prizes to those schools al
which confined their attention to the education of agriculturists. Ma
schools had been started on the public school principle, which \
the only one, he thought, for which success could be claimed.]
what test had the upper classes after their sons had been at a priv
school, but the test of a public school? Supposing the farmer to]
a sufficient sum for the training of his boy at a private school, and
be unwilling that he should undergo the test of the middle cl
examination, what incentive was there in a school of thirty or fo
pupils for boys to prepare themselves for a wide and search
examination? In larger schools the incentive to work was mu
greater, inasmuch as with a greater number of boys the prizes giv
however small in number, acted as a stimulus, and proved to
parents the amount of proficiency attained by their sons. There \
already a school at Lancing, in Sussex; at Hurstpierpoint a still lar
one for a thousand boys was rising. There was also one in Suff
with which he himself was connected, and for which a sum of 14,0(
had been raised by the voluntary contributions of the gentry.]
school in Suffolk, which would be opened in October next, was desig
for all classes, not agriculturists alone; and in order to anticipate
objection that the education it would afford would be so good that
higher classes chiefly, instead of those for whom it was more parti
larly intended, would avail themselves of it, he might state that it
been determined that the whole cost of board and education sho
not exceed 24*l*. per. annum, to include all expenses. Now, suppos
they had 300 boys to deal with, they could afford to give for
money a far higher education than a small private school could.

With the feeling that appeared to animate gentlemen in so m
counties where they were about to commence the formation
schools of this sort, the Council of the Royal Agricultural Soc
would be very wrong if they did not lend a helping hand to th
who so proposed to make personal sacrifices for the sake of
farmers of this country. The Council here would not pretend
send inspectors to such schools, or go through forms of that desc
tion; but if papers on agricultural subjects by pupils in the diffe
schools were sent up to their professors (who he had reason
believe would willingly give their aid), and if to the aut
of the most deserving papers prizes,—or better still, scholars
were awarded,—the examination would give an assurance to
farming class that at least the particular school which trained
successful candidate was teaching the boys the elements of what
had afterwards to learn practically. It was difficult to know
to do with boys between fifteen and twenty years of age; b
a rule they did not remain at school after they were seventeen.
thought, therefore, that previously to that time the province o
school should be to give them as sound and good an educati
possible: they would then learn to apply to practice their scie

attainments in chemistry, &c., in the course of a few months spent upon a farm after leaving school, to far better purpose than on any number of farms connected with the college.

The Rev. Prebendary Brereton said that last year it was a question whether his school at West Buckland, in Devonshire, could keep within the estimated expenditure. It had now been going on for about five years. It began with two or three boys only, and there were now sixty. The terms were 20*l.* a-year for boys under thirteen, and 25*l.* for those who were above that age; but this year the charge for the younger boys had been raised to 23*l.*, and that would make the average 24*l.* Last year the payments for the boys fell short of the expenditure by 51*l.*; but during the quarter just ended the expenses had been more than covered by the payments, the latter amounting to 383*l.*, and the cost of board to 243*l.* All the other expenses last year for salaries, taxes, &c., came to 415*l.*, and, estimating these at the same rate this year, he calculated upon having a surplus of 145*l.* or 3 per cent. upon the capital. The head master received 120*l.* a-year, and was provided with a house to live in. Two under masters had 40*l.* a-year each, and their board was reckoned at about 20*l.* each, for forty weeks at 10*s.* a-week. The cost of the boys' board was 8*s.* a-week each. The head master had also assigned to him any profits that might remain over and above a dividend of 3 per cent. Of course the boys were not clothed by the institution, and those who learnt Latin paid extra; otherwise the 25*l.* a-head covered all expenses. The food was as good as could be desired, and there was an undoubted inclination displayed by the higher classes to avail themselves of the benefits of the school; but the check upon this disposition was to keep the expenses down, and if boys came there who required classical education and extras, to make them pay at a higher rate. Since the commencement of the school he had traced many of the boys, and found that a good proportion of them had turned to farming. At the outset he thought that practical farming might be connected with the school, but local circumstances obliged him to keep the farm altogether distinct. It was carried on, however, contiguous to, though not connected with, the school, in the hope that some pupils would be glad to receive a special education there. As yet the experiment of the farm had not decided him whether such a combination was desirable, though he had met with pleasing illustrations of the advantage of letting instruction in practical farming keep pace with the education given in the school.

For the raising of capital to establish other schools he approved of the principle of limited liability: a strict examination of the accounts was sure to be a check upon the master and matron. When there was a profit the shareholders could, of course, do what they liked with it; but if they appropriated it to the augmentation of the masters' salary, or as prizes or scholarships, as had been done in this school, all parties would be interested in keeping the expenses down, and there would be no danger that the desire of realising a good dividend might induce the proprietors to neglect the true interests of the school. He could honestly confirm the statement of Sir Edward Kerrison that for about

24*l.* or 25*l.* a-year a good English education might be given; b though it might include French to a certain extent, and mathemati a classical education equivalent to that of the upper classes could n be had for that sum.

Dr. VOELCKER, speaking from his experience in the education agriculturists, said he was convinced that the practical educatio such as is required by the sons of small tenant farmers, was mu better acquired at home than upon a farm attached to a schoo The farm, moreover, was an expense which fell heavily upon agricu tural schools, and without it, he believed that with some little care th could be made self-supporting. They required to be supported by t influential men of the county, and such encouragement as Sir Edwa Kerrison had suggested that this Society should afford would be m beneficial; but it was in vain to hope that anything like a good p fessional education could be given in any establishment especially aside for the instruction of the farmer. It was impossible to inst more than three or four pupils together in one business. Wher there were a number of lads brought together, they would be sur do anything but what they ought to do. In school they could be under perfect control; so also in the lecture-room; but it was p tically impossible to give to a number of young men instructio classes upon a farm. The sons of wealthy farmers required t specially instructed in the great art of making experiments, an deriving advantage from a more careful observation than was, perh needful on the part of the small tenant farmer, for the simple re that the latter had not the means at command of bringing into pla fruits of a superior education. A lad, who, up to his fifteent sixteenth year was instructed in the elements which were usu taught in general schools, and in addition, perhaps, in the element natural science, especially chemistry, would, when occupied upon farm, practically turn out a much better agricultural chemist an more careful observer of the facts of natural history than the lad w was instructed with special reference to his occupation in the eleme of a particular branch of science, such as chemistry or botany.

Professor COLEMAN entirely agreed with Professor Voelcker th there was a difficulty in commanding the attention of large classes students upon a farm, and making the instruction sufficiently perso to be of value. At the same time, he could not admit that mu information might not be derived by students from the teaching of farm. If success in practical farming depended so much upon lo experience,—and the practice depended largely on soil and climate,— would be absurd to suppose that instruction upon a farm, irrespect of its situation and soil, would fit the student to take charge of a fa and embark a large amount of capital upon it, where the conditi were altogether different. But that much useful general informat available for future development with reference to special cases, hereby conveyed he certainly believed.

Mr. WREN HOSKYNS said that the subject of agricultural educa as one that had always presented considerable difficulties, pa ...ng to a sort of ambiguity in the expression itself, and partly f

the nature of the class to which it was applied. The question that Mr. Holland probably intended was, how far education might itself be so adapted and directed as to convey some special advantage to agriculturists as a class. Now, that embodied a very considerable difficulty, because he was not sure whether they were right in speaking of farmers as a class at all; for how could they classify under one head a body of men extending from the occupier of 30 or 50 acres up to the person who might be the owner of 2000 or 3000 acres, which he was absolutely farming himself without the assistance of any tenant-farmer? The class was so extensive that any attempt to legislate, so to speak, for it would be entirely futile, because the body to which the legislation would apply would require a hundred or more different modes of treatment. But the question of education, if attempted to be applied to the wealthier class of agriculturists, would be regarded as almost a presumptuous interference, because they were well able to educate their own sons, and were assumed to be well educated themselves. The very separation, however, of that portion of the agricultural classes from consideration, necessarily reduced the question to the education of the poorer classes of farmers, who, Professor Voelcker said, must be the special subject of consideration. Now there was a greater difficulty respecting the education of that class than, perhaps, of any other body of men in the country; first, because they were so widely separated from each other, and individually so far removed from the influence of education; and next, because the practice of agriculture—that was to say, constant occupation from six o'clock in the morning until six o'clock at night in the business of the farm—was so exceedingly detrimental to the exercise of the mental faculties during the remainder of the day. Unless, indeed, a portion of the early part of the day were cut and carved out, and absolutely devoted to the purposes of intellectual culture of some kind, no good could be done, for the attempt to put books in the evening into the hands of persons who had been the whole day occupied upon a farm, a plantation, or an estate, was almost futile.

They must, therefore, in their deliberations in the committee, and even at that moment, address themselves to this point—What were the means by which they could bring educational influences home to the farmer? Beside the establishment of schools, it was important for the committee to consider—How, through the aid of this Society, to bring to bear upon the home life of the poorer class of farmers, and particularly their sons, the most powerful educational influences. When, after the death of Mr. Pusey, the discussion took place respecting the 'Journal,' an opinion which found some favour was that of cutting up the publication into smaller dimensions, so that it should be more available for practical home-reading, converting it, as it were, into a sort of 'half-hours with the best agricultural authors.' Thus it was hoped to bring before the agricultural mind, with little difficulty, subjects that would evoke and excite intelligence in reference to the particular pursuit in which it was engaged.

When he acted as a juror during the International Exhibition, he remembered being asked by the foreign members of the jury, what

was the amount of the agricultural produce of England, what were the particular productions of the east or the north of England, and a number of other questions, which it struck him at the time no English farmer ever asked, and which he was afraid very few of them would be able to answer. But to French, Germans, Austrians, Portuguese, Americans, and Canadians alike, he was obliged to return the humiliating reply that we had no means of ascertaining what was the agricultural produce of the country; and so surprised were these gentlemen that they seemed to be really incredulous of the fact. He had alluded to this subject, because it was one of the matters which he should like to see occupying the attention of the farmer and his sons, leading as it would to the question of what was the agricultural produce of other countries. He had often heard farmers who suffered from low prices speak of the quantity of foreign corn that was imported into the country; and they did so evidently without any knowledge of what was the best course for them to take under the circumstances, simply because they had no means of ascertaining what the resources of the world were in respect of the different kinds of grain; of barley, as compared with wheat, or oats as compared with barley; what kind of climate was most suitable for barley or oats; and how far competition was likely to be greater or less in different kinds of grain. He had glanced at these topics because they were constantly spoken of by farmers in the markets, and in conversation with their landlords and each other; and he had remarked that farmers took a great degree of interest in them. He feared, however, this Society had not quite done its duty in bringing these subjects forward in a manner that would add to the intellectual enjoyment of their pursuit, although they were topics to which farmers would most readily address themselves.

The CHAIRMAN, in moving the thanks of the meeting to Mr. Holland, said he should be extremely gratified if the committee felt it their duty to recommend some general practical plan upon the subject, and also considered it expedient to propose that some prizes should be offered by the Society for the most proficient of the pupils educated at the proposed schools. It would, perhaps, be difficult to carry into effect any practical plan during the present session; still, if they had a report from the committee, it might be considered by the council; for such an important matter could not fail to excite very great interest and discussion. The cost of such institutions would, no doubt, be considerable; and if land were added to each of them, it would greatly augment the cost. Suggestions had been made by various gentlemen with regard to the appropriation of the funded property of the Society; for example, that, instead of investing it, it should be employed in some other way in order to enlarge the operations of the proposed institutions. If it were to be appropriated to any purpose of the kind, he should certainly say that the best plan would be to expend a portion of the funds in the establishment and support of prizes and scholarships. It had been truly observed by Sir E. Kerrison that they could not increase the quantity of the acreage of the country. They could, however, greatly augment its cultivation

and he might mention that he had seen a letter from Mr. Hudson, of Castleacre, to Mr. Mechi, dated Dec. 5, 1863, in which the writer said "You are quite right in saying that the lands of England are not much above half-farmed. Depend upon it there is not nearly enough capital employed upon them." In that opinion he (Lord Feversham) also concurred; and the difficulty undoubtedly was to make sufficient manure, or to obtain it at a fair price.

Mr. WELLS, in seconding the motion, observed that the preponderance of opinion expressed that day was rather against giving special instruction, either in the new or existing schools, for the education of the agricultural classes. He should be glad, however, to see the special education of agriculturists as far as possible promoted; and he thought that, without attaching farms to the schools or colleges, such a special education might, to a certain extent, be imparted. If the elements of chemistry and a rudimentary knowledge of the steam-engine were specially encouraged in these schools, he considered that it would be very advantageous.

Mr. HOLLAND, in reply, said it was satisfactory to find that they were all agreed on the point that the basis of instruction for a well-educated Englishman, whatever his after profession, should be public and liberal, including all branches of natural science as well as mathematics. After a lad had quitted school, if he had to become a farmer, he must have practical knowledge, and that practical knowledge must be connected with science; science and practice must go together; and the difficulty was, how that knowledge was to be given to the very large and scattered class to which Mr. Wren Hoskyns had referred. The class, however, might be narrowed by remembering that those who farmed their own land, or were occupiers of very large farms with ample capital, were more or less blended with the class above them. That, therefore, would diminish the number of those to whom they would have to pay attention: and if they looked to the small farmers, Mr. Brereton, in his pamphlet on education, had marked out a limit by drawing the line at the holders of farms from 300 to 500 acres, just to show that the object was to assist those who were not able from circumstances to take advantage of the institutions which were already in existence for the classes immediately above them. The committee would go to work as soon as they possibly could.

Meeting of Weekly Council, Wednesday, June 8th. Mr. THOMAS RAYMOND BARKER in the Chair, Professor SIMONDS delivered the following Lecture.

ON SMALL-POX IN SHEEP.

Professor SIMONDS said:—The disease recognised under the term small-pox in sheep is one of considerable interest to the agriculturist, firstly, because of the rarity of the affection; and, secondly, because of the fatality it produces among the animals that are its subjects.

SHEEP-POX NOT IDENTICAL WITH SMALL-POX IN MAN.

The term small-pox has sometimes been objected to on the ground

that the disease is not positively identical with that whic called in the human subject. There can, however, be no d of opinion between medical men as to the intimate analogy whi between the two affections; and it may be said that they are as allied as it is possible for any two diseases to be that affect of different species. Indeed, it has been rightly observed t agree as much as any two mushrooms of different species, two algæ, or vegetables of other low class, may be said to dc being the case, the propriety of the term that has been given affection cannot be questioned, although the term itself may l to some incorrect conclusions on the part of individuals, *e. g.*, disease having had a prior existence in the human subject, ha through ordinary infection from man to the sheep; or that ha its origin in the sheep, it was liable to extend from the shee human subject. Both these views are erroneous. The outb sheep-pox in this country can in no way be traced to di prior existence in the human subject, and its communication to the sheep; nor can we say that the disease, having appeare sheep, has spread to the human subject. Speaking in gener and bearing in mind that these diseases are of distinct species, so closely allied, I think we may say that the small-pox o so far as we are acquainted with it, is an affection which exclusively to the sheep, and has not yet been proved to be of being communicated to either the human subject, or an ticated or even wild animal. Experiments on a very large sc been instituted, and these have been invariably attended wi tive results. In the year 1848, when the affection was exceedi among sheep, acting in conjunction with Mr. Marson, Surge Small-Pox Hospital (who is considered to be one of the highe rities in variolous diseases in this country), and Mr. Ceeley, o bury (who has devoted almost his whole life to affections description, and is employed by the Government to see that cine matter supplied to the hospitals is obtained from proper I inoculated several children with the virus of sheep-pox, and, instance, we failed to produce any special disease. Abortive rose on the arm in some cases, but came to nothing. I ma say, that, in inoculating sheep, as I have done now on a large scale, it has not unfrequently happened that, owin sheep plunging about, the needle charged with the vi entered my finger, and I have thus accidentally inoculated probably not less than from 15 to 20 times, yet I have n perienced the least possible inconvenience. It has also l that in the same accidental manner I have inoculated sl and men who were assisting me in performing the operati these individuals, too, there has always been a negative It is well that one can speak in this positive manner, a notion has been entertained by labourers and other un men concerned with sheep, that they and their families ar to contract this variolous disease, and some of them have hesitated to assist me either in the examination or inocul

rom an apprehension that they themselves would become I will not dwell further on this part of the subject, except that experiments have shown not only that our ordinary ated animals are insusceptible to the action of the virus, but s likewise the case even with the goat, an animal closely allied heep. I have inoculated many goats, and several of them id four times over; I have also kept them among hundreds lous sheep for weeks together, and yet I have never seen one any way from the affection.

ORIGIN OF THE DISEASE IN ENGLAND.

ie now to speak of the outbreaks of the disease that have l in this country, which is necessary, because some persons ought that small-pox is of spontaneous origin. This view rtained by many, and especially during the outbreak in 1862 hire, because we were not able to trace precisely the manner h the disease was carried there. Persons who hold the that special affections may arise from a combination of causes, laid hold of the fact of the appearance of the in an isolated part of an isolated county of England, where as little traffic in sheep, as good proof of the spontaneous f the disease. I may here, however, adopt an expression Vm. Budd, of Clifton, who read an excellent Paper on this before the meeting of the British Association in August, d say, with regard to the spontaneous origin of these diseases, a thousand years or more we have been endeavouring, in ay possible, to manufacture a special poison; that is to say, brought into operation all known causes of disease, and all tions of such causes, not only in animals but in ourselves, have hitherto failed, with any combination of these causes, ice a single instance of a special poison. We cannot manu- the poison of the rattlesnake, or a special animal poison of l or description. Thus you see that all common or ordinary re perfectly inadequate to account for the introduction or ice of this disease into England. The affection has been d most accurately by continental writers from the earliest nd perhaps there is scarcely a part of the Continent where it frequently existed. Were I to start off now on a mission, e I should have no difficulty in reaching the disease in s in several places, here and there, on the Continent. Yet to say it has been reserved for the present generation to acquainted with the introduction of the disease into England, vas connected with the free importation of foreign sheep. ase was first introduced in 1847 by some sheep which were so subjects of the malady that the seeds of the disease,—the matter,—were lying in a dormant or latent condition in stems at the time. These facts were laid before the public in which I brought out in the year 1848, in which I traced every al lot of sheep imported; the vessel which had brought them

here; where they were sent, and all about them. I gave the full history, and the correctness of my statements has never been disputed.

I have another object, however, in directing your attention to the two outbreaks of the disease. At the time I wrote that work, I believed, from all the researches I had then been able to make, that England had been entirely exempt from the affection until 1847, although there are most satisfactory accounts as to the progress of the disease on the Continent, from the latter part of the fifteenth century down to the present time. A year or two afterwards, however, on looking through some old works upon diseases of this nature, particularly measles and small-pox in the human subject, I met with one by Dr. Fuller, dated 1730, in which the author labours to establish the fact that variolous diseases are distinct and separate; and not only so, but that if a disease such as small-pox cannot be communicated from the animal to the human subject, it cannot be regarded as a similar affection. Then, taking up the view which I have combated, viz., that we do not require positive identity, but an analogy between these affections,—he says:—

"The small-pox and its spurious sorts are peculiar to man, exclusive of all other animals. Mr. Mather, indeed, in his letter from Boston, in New England, saith that Dr. Leigh, in his natural history of Lancashire, reporteth that there were some cats known to catch the small-pox, and pass regularly through the state of it; and at last he telleth us, we have had among us the very same occurrence. But if we had seen and examined the matter, perhaps it would have been found a very different thing from our own small-pox. For, in like manner, there was about the year 1710 or 1711, upon the Southdowns of Sussex, a certain fever raging epidemically among the sheep, which the shepherds called the small-pox, and truly in most things it nearly resembled it. It began with a burning heat and unquenchable thirst. It broke out in fiery pustules all over the body. These pustules maturated, and, if death happened not first, dried up into scabs about the twelfth day. It could not be cured—no, nor in the least mitigated by phlebotomy, drinks, or any medicines or methods they could invent or hear of. It was exceedingly contagious and mortal, for where it came it swept away almost whole flocks; but yet it could in no wise be counted the same with our human small-pox, because it never infected mankind."

Any one familiar with sheep-pox, upon reading this account of Dr. Fuller, must come to the conclusion that in 1710 or 1711 the disease existed among the sheep in Sussex; but as to how it came there, how long it continued, and by what means it was got rid of we are entirely ignorant. We have thus a history of the first outbreak, in 1710; the second in 1847, extending down to 1850; and the third which occurred in 1862 in the county of Wilts.

The Sheep-Pox in Wiltshire.

There are some few circumstances which at least afford a fair presumptive evidence as to the manner in which the affection was intro

duced into so remote a part of England as Wiltshire. It must be borne in mind that just previously to, and also after, the appearance of the disease in this county the malady was existing in Hanover and parts of the duchy of Lauenberg, where these and other States unite. At that time we were drawing our chief supplies of foreign sheep from these districts, shipping them at Hamburg, and Tonning, as the chief ports of Slesvig, Holstein, &c. There can, therefore, be no doubt that we were importing sheep from a district that was to a considerable extent infected; and we may presume that some animals in whose systems the disease was incubated were thus introduced into England. The sanitary police regulations in those countries with regard to the exportation of diseased cattle would, no doubt, prevent any great number from coming here; still with an affection like this, which no man can recognise while dormant in the system, we can well understand that a few sheep may have passed the police regulations and found their way into England. With this we must couple another well-established fact, namely, that butchers have now for some years past been in the habit to a very large extent of making their purchases in the metropolitan market for the supply of various parts of England. Instead of drawing their supplies, say for Birmingham, from the surrounding neighbourhood, they purchase oxen and sheep in the London market, put them into railway trucks, and send them down to Birmingham to be slaughtered. And this is the case with almost all the large towns, even as far down as Manchester. The camp at Aldershot, too, is supplied almost entirely in this way. Again, we find with regard to some of our seaports, such as Brighton and Dover, where soldiers and sailors are congregated in large numbers, that to these places also cattle and sheep are sent every market day from the metropolis. These facts lead me to think it not improbable that some diseased sheep were purchased in the metropolitan market, and found their way westward. Where they went to few know, and I dare say that those who could throw a light upon the subject would hardly be disposed to do so. Unless we have, so to speak, their confession, we shall, however, never be able to arrive at all the facts of the case. But I will further presume that the period of incubation had passed in these sheep, by, or nearly at, the time when they had arrived at their destination in the West. The person who had purchased them, seeing an eruption of a peculiar kind break out all over their bodies, would be convinced at once that the animals were of no use for human food, and that he must by some means get rid of them. For when the disease shows itself, there is not only this remarkable eruption on the body, but also great constitutional disturbance. The animal sickens, it holds its head down, its ears are lopped, it refuses all food, it is the subject of intense fever and suffering; and, supposing that nothing is done, it drags out a miserable existence up to the time of its death. I believe that something of this kind must have shown itself. The man would then say, "These sheep are of no use to me to dispose of as food; I must get rid of them somehow;" and accordingly he did get rid of them by sending them

probably to a manure manufacturer for the sake of the salvage. I say a manure manufacturer, because I have to make mention of another fact, which I think will assist in accounting for this outbreak. It is this: the sheep belonging to Mr. Parry, of Allington, near Devizes, which were the first attacked in the county, were during the months of April and May fed in a field on the side of the canal connecting the Avon with the Kennet; and they were there for very many weeks. Within a mile from this identical field, is a very large manure manufactory. To that manufactory bones and all sorts of animal refuse, collected by individuals from Wiltshire, Berkshire, and the adjoining counties, after being accumulated at Devizes, are sent up by boats. Now, I was consulted with reference to the appearance of the disease in Mr. Parry's flock in July, 1862; and seeing the state of things which then existed, I was enabled, from my practical knowledge of the affection, to say at once that the disease had been existing in the flock for many weeks; and on tracing it back case by case, I arrived at the conclusion, which I stated to Mr. Parry, that his first sheep became affected with the disease about the first week of May. In endeavouring to throw light upon the outbreak, I visited the manure manufactory, and was allowed by the proprietor to go all over it; and in a shed where the materials to which I have referred were stored, I saw not merely the bones of sheep and other animals, but, very much indeed to my surprise heads, legs, and portions of the bodies of sheep with the skin on evidently showing that sheep, from whatever cause they might have died, had been cut up, skin and all, and sent here for the making of manure. I do not mean to say that any examination of these refuse materials showed that the skin was in a diseased condition, but in that manufactory I distinctly found the refuse matter of sheep cut up in the way I have described. I also ascertained from the books of the factory that a boat-load of refuse animal matter was received from Devizes on April 29th. I believe, then, that some sheep affected with small-pox were cut up in the manner I have stated; that the materials went along the canal in boats; and that Mr. Parry's sheep, being on the banks of the canal at the time, were infected by the special morbific matter which spread from the mutilated carcasses of these small-pox sheep. It is singularly confirmatory of this theory that a bridge crosses the canal close by, so that when boats meet there one must wait for another to pass before it can proceed further: and it is not improbable that from some such cause there may have been a delay in the passage of the boats at that identical spot. Of course this is all presumptive evidence; but if we couple all the facts and presumptions together, I think we may arrive at a tolerably fair conclusion with regard to the cause of the outbreak of the disease in Wiltshire.

Diagnosis of the Affection.

In the next place, I come to speak of the nature of the disease, and to describe the symptoms by which we recognise it in its several successive stages. First, as to the period of incubation. Judging

ı what wo see of the progress of the affection in a large lot of 'p, and from the experiments made with a view to determine this ortant point, we have come to the conclusion that there is little ation in the time of incubation. The disease may appear on ninth day, or may be protracted to the eleventh; but speaking rally, ten days may be regarded as the period of incubation. At end of this time the sheep sickens, refuses its food, has a hurried thing, accompanied by a hot state of the skin, an almost unıchable thirst, a bloodshot condition of the eyes, and a discharge ı the nostrils. All these are indications of the febrile state of the em, and simultaneously with it a particular eruption takes place he body. If the eruption is very copious, the case assumes is generally called the confluent form; that is to say, the papulæ pimples) coalesce and run together, as it were, in chains. At s the papulæ are distinct and separate, and then we speak ıe case as mild. We divide the small-pox in sheep, therefore, two varieties, the same as in the human subject,—the benign l-pox and the confluent small-pox. This, the second, stage of lisease, speaking of the condition of the skin alone, lasts for three , when a peculiar change is observable in the papulæ, which, ad of being red, and thus showing a high degree of inflammation, me a white appearance. Invariably, when the disease has reached point, there is a slight abatement in the severity of the symptoms. fact is very remarkable, that the morbific matter which has red into the organism of the animal, through the medium of the ed air, and has been lying hidden for ten days, has nevertheless ug the whole of that time been appropriating to itself some of materials or constituents of the blood, and multiplying to such xtraordinary extent as to lead to a copious eruption on the skin. this eruption is nature's own conservative power; her means of ing the system of the poison which has grown within it. The cles which rise on the summit of the papulæ cause their colour hange from red to white; the scarf skin raised by an effusion fluid beneath, constituting a sort of blister. Every one of e vesicles will yield that same morbific matter in a sensible ı, which has entered into the organism in an unrecognisable ı. It is, therefore, in this stage of the disease that we can obtain material for any experimental purposes for which we may require In consequence, also, of the morbific matter being thrown out on xternal surface of the body, the constitutional symptoms are conably relieved. In the next or ulcerative stage, we observe that a t number of the vesicles burst, their contents are lost, and they into thick brown scabs. Some decline entirely, while others go o ulceration. When animals reach this stage of the disease, we riably find an increase of the constitutional symptoms; for though e vesicular stage the disease is not fatal; animals which have held so far are almost certain to die if ulceration follows. According e general strength of the animal's constitution, and the treatment management observed towards it during its illness, we date from time the recovery of the animal, but this is accompanied with

similar results to those we find in the human subject, viz., pocked faces, and a cicatrised surface of skin.

Fatality of Sheep-Pox.

The fatality of the natural disease in a flock of sheep when unchecked, except by the removal of infected sheep, and by observing a careful system of management towards them, will not unfrequently reach as high a figure as 50 or 60 per cent. Where circumstances have been unfavourable I have known the disease to destroy 90 per cent.; and if we take animals originally the most healthy, and place them under the most favourable circumstances with regard to weather, management, medical treatment, and diet, it very rarely falls below 25 per cent.

Remedial Treatment.

In speaking of the means at our disposal to lessen the fatality of the disease, and to secure animals against a natural outbreak of the affection, two or three things offer themselves to our consideration. One course is the early separation or segregation of the animals. This plan has been a good deal too much extolled by individuals who possessed only a limited experience of the affection. I readily admit its value, nobody perhaps more so; but I say that we must not depend exclusively and entirely upon it, for in practice we find that the disease may break out in a flock consisting of 800, 1000, or 1200 sheep, as it did in the breeding-flock of Mr. Parry, Mr. Neate, and other gentlemen in Wiltshire. No man can tell the hour at which the eruption will come out; but from that very moment, if not before, the disease is infectious. An examination, or at any rate a close inspection of every individual sheep two or three times a day is therefore necessary. But even more than this is essential, in order to make sure that no small-pox sheep is left in the flock. As the disease frequently assumes a benign character, there may be benign cases not easily recognised in the flock, and though these will not in themselves be dangerous, yet an animal taking the disease from these may have a severe instead of a benign attack. Therefore, these benign cases must be looked after very closely; for as the animals, especially early in the disease, do not lop their ears, nor drop their heads, nor refuse food, it is possible they may be left in the flock and do irreparable mischief. Practically, then, every sheep should be caught each day and turned up, and its arm-pits and other parts examined to see whether it is affected with the disease. But who, I ask, would like to incur the labour of thus examining 1200 sheep, and rely on the results of this search as his only safeguard? Suppose as a parallel case, that there were a public institution in this metropolis where there were three or four hundred children who have been neglected in early life, and have not been protected against small-pox by vaccination, and two or three individuals who became infected with small-pox were allowed to mingle with these children for an hour or two every day. I will further suppose that the surgeon of the establishment, knowing that these

children are thus exposed to the disease, instead of having
rse to vaccination to protect them, goes amongst them day by
and questions them as to whether they have a headache, feel sick,
so on; and that on finding a child who says it does not feel well,
nds it away; that on the following day he finds another child
ng a similar statement, and this he treats in a similar manner.
not obvious that a system of the kind, so long as it is carried out,
be the means of keeping up the disease, whether among children
eep? So much, then, for the separation, or keeping apart, of in-
d animals.

e next suggestion, which rests entirely on the same ground, is
of taking away the affected animals and killing and burying them
their skins on, so as to prevent their doing any further mischief.
imagine that under certain circumstances a man might go on
g his sheep, one after another, until he had destroyed his entire
and during the whole time be keeping up a source of infection
would spread far and wide. I am, therefore, no advocate of a
m of this kind.

The Vaccination of Sheep.

e vaccination of sheep as a preventive measure is a very im-
nt question; and I am happy to say that it has now been set at
if not for ever, at any rate for a considerable length of time, in
quence of the measures adopted by the Government, arising out
e recent outbreak of disease in Wiltshire. In order to deter-
the prophylactic value of vaccination, the Government purchased
sheep, which were placed under the care of Mr. Marson, the
eon of the Small-Pox Hospital, and myself. Those sheep were
d on a farm then in my occupation, in the immediate neigh-
hood of London, that we might carry out a series of experiments
them, to ascertain whether vaccination was protective or not.
Government had this question forced upon it by communications
h appeared in the public papers at the time, from some leading
ulturists in the counties of Norfolk and Cambridge, and also
surgeons in the latter county, who strongly recommended the
nation of sheep. Foremost among the Norfolk agriculturists,
Mr. Henry Overman, of Weasenham. That gentleman said
ffect that during his late father's life the small-pox showed
in their neighbourhood, and that his father vaccinated the whole
s flock; that the sheep took the vaccine disease; that they were
cted from the small-pox; and that any man who preferred inocu-
n to vaccination was little better than a madman. Statements
came from other persons, to the effect that they had vaccinated
sheep, and that they did not take the small-pox: but many of
parties did not even say whether or not the sheep had ever been
sed to the disease. Coming back, however, to the late Mr. Over-
: this gentleman stated, at a meeting of an agricultural society,
in Norfolk in 1848, that as a letter of sheep (Southdown rams), he
eived it to be his duty to send them out as free from disease
e possibly could, and therefore, when the sheep-pox showed itself

in his immediate neighbourhood, he had recourse to vaccina He went on to say, "I had 860 sheep vaccinated; I am very I did so, for I have not had any disease among them. I subsequently to that 20 score of lambs vaccinated, making altog 1260." Twelve hundred and sixty sheep were vaccinated, he and none of them had taken the disease.

Now I have good reason to believe that these 1260 sheep of Overman's were not vaccinated at all. The same gentleman wh these sheep also vaccinated, as it was said, a large number of shee Mr. Hudson, of Castleacre, a member of the Council of this So He likewise vaccinated, as he called it, a large number of shee other persons in that neighbourhood; so that, in all probabilit operated upon not less than from 3000 to 4000 sheep. Now, I ask any one who knows anything at all about the matter, wher all the lymph necessary to vaccinate 3000 or 4000 sheep i course of about two or three weeks come from? I find, however this gentleman had no difficulty whatever about it. He ca lymph, as he termed it, in phials pretty well filled to the brim. used this material on the sheep generally, and he used it on th Mr. Overman's sheep, with the exception of about twelve. Ac ing to an admission made by Mr. Overman himself to me were certainly not more than twelve of his sheep that were nated from *points* charged with vaccine in the ordinary way he added, "I did not see any difference between the vaccin done by points and that done by fluid, and I am satisfied, ther that all my sheep have been vaccinated." I have already state a number of sheep were done in the same manner for Mr. Hu In the course of a short time, however, Mr. Hudson's sheep, exposed to the influence of natural small-pox, took the disease it went on rather severely in his flock. He then had recour inoculation; but the person who was consulted, and who inoc the sheep, knew practically little or nothing about it, and sheep were consequently done in the most objectionable ma Instead of taking the smallest lancet, or a needle, and just soili with the virus, and introducing the virus with one puncture the skin, so as not to draw blood, he made large incisions i the arms of these poor sheep, inserting bits of tow charged with l and pus; and that he called inoculation. I witnessed this for m and never saw so painful a scene. Besides the sheep which others suffered from the sloughing of wounds the loss of an ea loss of an eye, and so forth. So far as the pecuniary questio concerned, many of the survivors might as well have died as Vell might inoculation carried on in this manner have got int epute in Norfolk! I mention one other case. A natural out f the disease having taken place upon a farm of Mr. Muske Yarford, the gentleman, who vaccinated sheep from a bottle, here and vaccinated Mr. Muskett's sheep, but the disease we unchecked notwithstanding, and four hundred ewes were lost ou ock of a thousand.

return t. he case of Mr. Overman's sheep. Mr. Overman

two sheep, after being pressed to do so, to the farm of a neighbour, in whose flock the small-pox existed; and these two sheep were inoculated on that farm; one of them by Mr. Cooke, of Litcham—a farmer who, I do not hesitate to say, at that time performed the operation far better than many so-called veterinary practitioners—and the other by Mr. Baldwin, a veterinary surgeon of Fakenham. Both sheep took the disease, and passed through its several stages; the result being in no way different from that which is observed in hundreds of other sheep that are unprotected. Mr. Overman, however, denied that these sheep did take the disease. Subsequently I proposed to Mr. Overman, that he should send five lambs to this farm where they would be exposed to the disease; and five other lambs to the Veterinary College; himself selecting his most successful cases of vaccination. This arrangement, although agreed to at first on his part, was not carried out. On the same farm to which the two sheep, inoculated the one by Mr. Cook, the other by Mr. Baldwin, had been sent, the gentleman who had vaccinated (?) sheep for Mr. Overman, Mr. Hudson, and others, was asked, not to vaccinate, but to inoculate the sheep. I do not know how he proceeded, but three weeks after his inoculation of the sheep, I myself saw the animals, and found many of them in the earlier stages of the disease; whereas, if they had been properly inoculated, they would have been in the third stage, and recovering.* The circumstance of these sheep having the *natural* disease at that time, was communicated to Mr. Overman, who made it the ground of his objecting to carry out his agreement with me.

There were, however, a few sheep properly vaccinated in Norfolk; some by Mr. Rose, a surgeon; seven or eight by Mr. Joy, another surgeon; and also some by a veterinary surgeon, Mr. Smith, of Norwich. In these cases proper lymph was used, and every care taken; and the unanimous opinion of these gentlemen was, that vaccination was of no avail, because it was found that both by exposure and by inoculation the vaccinated sheep took the small pox. The number of sheep really vaccinated in Norfolk in 1848, was only about five-and-thirty—not three or four thousand, as some persons have stated—and as I have just shown in the instances in which it was tried, it did not protect the animals against the natural infection.

I now come to the proceedings of Mr. Ramsay, surgeon, of Shelford, Cambridgeshire; who wrote to the 'Times,' in 1848, setting forth the great value of vaccination; and again in 1862 to the 'Standard,' which letter afterwards appeared in other newspapers. He says, in his communication to the 'Standard,' that in 1848 he vaccinated a large number of sheep for Mr. Jonas Webb, Mr. Samuel Jonas, Mr. Hurrell, and other gentlemen in his locality; and he leads his readers to infer that these sheep were perfectly protected against the infection of sheep-pox, and that vaccination, therefore, ought to be had recourse to in order to stay the progress of the pest in Wiltshire. Mr. Ramsay was backed up in this statement by Mr. Sprague, surgeon,

* The whole of these facts are stated at length in the Report to the Government, which has been sent in by Mr. Marson and myself.

of Kimbolton, Huntingdonshire, who in 1848 was his assistant, an who also wrote a letter, in 1862, to the public papers in support of th view which Mr. Ramsay had promulgated. Mr. Ramsay assume that the reason why his vaccination succeeded was, that he ha recourse to what in technical language is called retro-vaccinatio that is to say, he vaccinated a cow with vaccine lymph taken fro the human subject, and, having obtained the produce of the lym from the cow, he used it for operating upon sheep. With rega to retro-vaccination, I will only say that the experience of Mr. Ceele Mr. Marson, and myself, is, that there is rather a loss both in t quantity and the quality of the lymph by retro-vaccination than a ga and this opinion is supported by all continental authorities of a repute. If you take a quantity of lymph from the arm of a healt child, and introduce it into a calf—as calves are more susceptible th cows—supposing it takes, you get very little, if any, increase of t material, and no greater activity of it.

In 1848 I proposed to Mr. Ramsay that he should allow some the sheep which had been vaccinated on this plan to be subjected the counter-proof of inoculation. Through the intervention of M Ellis, of Triplow, in Cambridgeshire, Mr. Ramsay consented to sel two sheep which he had vaccinated himself, and send them to at the college. He did so, and wrote a letter to the 'Times' which he stated that he had sent two sheep to be tested as to t protective power of his vaccination. What was the result? I took o of the sheep and inoculated it with some *old sheep-pox virus* whi I had had by me for 16 weeks, during which time it might supposed to have lost some of its power, and I readily produced t disease from it. The animal went through all the stages of the shee pox, and when it arrived at the vesicular stage I took lymph from th sheep and inoculated the other; and with the same result. The two sheep were afterwards sent back to Mr. Ellis, who acknowledg the receipt of them. I wrote to Mr. Ramsay, saying that he was liberty to test the sheep by any subsequent inoculation, or expos to the disease, if he thought fit; that they were not protected wh they came to London, but were protected now. Yet, in the face this fact, this gentleman again came before the public as an advoc for the vaccination of sheep in 1862.

I trust that I have said sufficient to show that the agriculturist h been misled to some extent as to the effects of vaccination, and for th reason I think the Government deserves great credit for having det mined to test the thing on a large scale. I would epitomise our o experiments by saying that in every instance in which Mr. Mars and myself have been able to produce the vaccine disease in shee the animals, when exposed by us to natural small-pox, have taken i and in every case also in which we have subjected sheep to the count proof of inoculation they have taken sheep-pox, and the disease h not been in the least degree mitigated by the previous vaccinati We have also found this very important fact—that whereas Mess Ramsay and Sprague speak as if the hundreds of sheep on which th [illegible] all successfully vaccinated, and as if every sheep w

just as susceptible to the vaccine disease as the human subject—that not more than 35 per cent. of the sheep, in our own experiments, proved to be susceptible to the vaccine disease on a first vaccination.

Inoculation the only Real Check to Sheep-Pox.

I do not hesitate to say that when the natural disease appears in a flock, inoculation, properly carried out, is the best and the only sure means of arresting its ravages. It is not to be supposed that in advocating inoculation we neglect separation or segregation, or any other means of abating the severity of the disease, or that we introduce sheep-pox into healthy flocks. We only have recourse to inoculation that we may bring the disorder within bounds, and cut off the supply by which the malady is naturally propagated. One of the good effects of inoculation is that it limits the extension of the disease. All animals that are inoculated will, in the space of about five weeks, especially if they have been dipped in a disinfecting mixture, be in a fit condition to be sold; whereas, if the natural disease went on, it might be five or six months, or even longer, before such would be the case. Nobody indeed could tell when the thing would end.

But some people say that inoculation spreads the disease. In the abstract there can be no doubt that the inoculated disease is infectious; but it is infinitely less infectious than the natural disease, and practically, therefore, sheep-pox as a rule is not spread. Indeed, there is not a single instance in Wiltshire in which the disease can be said to have been spread by inoculation. On the contrary, it was hemmed in and limited to the flocks that became affected in the natural way. The reason why inoculation does not spread the disease is that, as a rule, and particularly when you are dealing with young animals, such as lambs, it gives the disease in a very mild form. Take a hundred lambs, and if inoculation has been properly carried out, not more perhaps, than one in six or seven will be found to have any eruption at all on their bodies. They have the disease, so to speak, locally. But with old animals there is greater fatality.

I have been at some pains to collect information, not only from my own experience, but also from that of others, with reference to inoculation in this country in the outbreak of 1862, as also of that extending from 1847 to 1850, when there were more sheep in one part of Norfolk affected at one time than suffered in Wilts altogether. Thousands of sheep were subjected to inoculation in Norfolk, Suffolk, Essex, Kent, Cambridgeshire, &c., and I feared that the disease would be really naturalised among us, so widely was it then spread, but notwithstanding this, we had not half the hue and cry which was raised about only 3000 sheep being affected in Wiltshire. Taking all the cases of inoculation together, I come to the conclusion that there have not been less than 20,000 sheep inoculated, and that the average mortality has not reached 5 per cent. In some particular flocks the mortality has not been more than 1 to 1½ per cent., and I can show instance upon instance in which it has not exceeded 2 per cent.; but, combining the worst cases with the best, the deaths from inoculation have not attained 5 per

cent. This fact is, I think, quite sufficient to prove, with entering into further detail, the great value of inoculation, as a of arresting the progress of small-pox in sheep, if it be prope rightly carried out. I abstain from mentioning the rules whicl be followed with regard to inoculation, because this is a matte is not well fitted for a meeting like the present, and because rather wished to confine myself to the more salient points co with the important subject of the small-pox of sheep.

The proceedings were brought to a close by a vote of thank Lecturer.

Meeting of Weekly Council, Wednesday, June 22nd. Lord Fev in the Chair.

Dr. Voelcker delivered a Lecture on the Chemical Quali Water for Economical Purposes.

Dr. Voelcker said: An abundance of fresh air, a good su pure water, and a sufficiency of wholesome bread, are unquest the three greatest material blessings which a kind Provide supplied for the use of man. Whilst it is universally admitt we could not live for any length of time without them, it is that in actual practice many people appear unconcerned respe supply of pure wholesome water. It is admitted in theory to l necessary for towns as well as for the country; and yet, when we detail, we frequently find people entirely unconcerned respec source from which they obtain their water, or the quality of th they actually use. Thanks to the Sanitary Commission, almost large towns are now well supplied with an abundance of good available for all the ordinary domestic purposes. Great care ha cially been exercised in providing for the metropolis, but i country towns, as well as in villages and isolated farm and houses, the water is often very impure. This can only be at to an utter disregard of those properties which are all-importan supply of our daily wants. It is no doubt for this reason Chemical Committee have desired me to give a lecture on the c and physical qualities of water intended to be used for o domestic, and general economic purposes. In my remarks confine myself to those common uses which we ordinarily n water, without referring to its applications in various othe such as ice and steam.

Water Supply Defective in Country Towns.

I have frequently examined well-waters which I found to regnated with an amount of injurious organic matter, and of substances of a questionable character, that surprised me very Several of these wells contained nearly three times as much matter as the tank liquid which Mr. Mechi usually applies to hi Now impurities which are highly injurious to health are neficial in promoting a luxuriant growth of plants; we th

only waste useful manuring matters by allowing substances which ought to go on the land to find their way into our wells, but we contaminate water with poisonous matters, which every now and then manifest themselves in sudden outbreaks of low fever and other disorders. As I have a great objection to speaking in general terms without being able to lay my hand on special cases, I may observe that Cirencester, where I resided for a good many years, affords a very fair illustration of the condition of country towns in this respect. It is naturally a very healthy place, but the drainage is essentially bad, and in some houses and streets the water is so contaminated with injurious substances that people will not reside there, for it is notorious that the localities in which this bad water is found are occasionally visited by fever. This holds good with regard to separate houses, as well as the town itself. When I first went to Cirencester I was anxious to live away from the town. I looked over a certain house, which pleased me in every respect, but some one said to me—"Do not go to that house, even if you can get it rent free, because all the people who have lived there have suffered seriously on account of the unwholesome state of the locality; the water is bad, and the drainage is bad." On examining the water I found it very bad indeed. I ascertained at the same time that the supply came from a surface spring, into which no doubt the drainage of the house, the offices, and the yard, found its way. Well, at first this warning made me hesitate, but the spot was too enticing to be dismissed from my mind without an attempt to remedy the evil. My first step was to stop the supply of water by cutting off the drainage from the house. I walled over the well in the house, and compelled the servants to use water from a deep well in the yard, which was of excellent quality; and I am happy to say that, through this simple means, I succeeded in maintaining my own family in perfect health; so much so that during ten years I did not spend a farthing for medicine.

Now bad water occurs very much more frequently, perhaps, than is generally supposed; at least I infer so from the many samples of water totally unfit for drinking purposes which I have received during the last year. Those who reside in the country, supplying themselves with water where there is no general Board of Health to make provision for their wants, should have a watchful eye to their individual premises. Allow me, then, to point out the properties which we most esteem in water, first for drinking, and then for washing and cooking purposes.

Water for Drinking Purposes.

There are four properties which we most esteem in drinking-waters; first, the absence of any putrescent organic matter; secondly, the absence of any discoloration, due either to suspended fine clay, which gives water a muddy appearance, or to dissolved organic matter, such as we find sometimes in peaty districts; thirdly, softness; and fourthly, coolness. It devolves upon me to show how these four properties are intimately connected with the chemical composition of water.

The absence of putrescent organic matter is accounted for in the

case of many waters by the perfect filtration which they undergo in passing through a porous rock or a bed of porous sandy soil. Surface springs invariably contain organic matter in solution, and sometimes if the filtration has been imperfect, a further quantity in suspension. Wherever men or animals congregate refuse matter accumulates, and finds its way into surface wells. An admirable provision is made for the destruction of these matters. Wherever the drainage is good the air which passes along with water through the porous soil almost completely decomposes the organic matter, or at any rate makes it innocuous. We have, then, in the absence of putrescent animal matter, a very good indication that the water is serviceable for drinking.

The presence of a bad smell invariably indicates something wrong in water, though its absence affords no assurance that all is right. Organic matter, however, though always unpleasant is not always injurious. That which occurs invariably in localities where peat abounds in the soil is, I believe, not directly injurious to health, though its presence in water is undesirable, because experience has shown that organic matter of any kind has an injurious effect on the leaden pipes through which water is conveyed to our houses.

It is, then, important to discriminate between the different kinds of organic matter that we are likely to meet with in water; and an excellent method of doing this is to evaporate from a couple of pints to two ounces. If during the evaporation the water becomes coloured it will generally be found that it contains an amount of organic matter which is injurious to health; if it remains colourless, or becomes but slightly coloured, the absence of organic matter of an injurious nature may be safely predicated. If after the water has been perfectly evaporated to dryness, the matter which remains, on being heated, gives off a smell like burnt feathers, which is characteristic of the presence of nitrogenous matters, we have in this at once a proof that the organic matter is of animal origin, and the water should be at once rejected for drinking purposes.

Softness is a quality in water that depends entirely upon its composition. Nowhere in nature do we find water in a perfectly pure state. Even rain-water, which has undergone a kind of natural distillation, contains certain atmospheric impurities which, though useful in an agricultural point of view, are undesirable in drinking-water.

Rain-water is an excellent solvent for many combinations that occur in the soil, acting not only on saline substances like common salt, or on sulphates, such as sulphate of magnesia or sulphate of soda, but also on mineral matters, which are usually regarded in common life as insoluble.

We may instance carbonate of lime, one of the principal constituents of all hard waters. Practically speaking, it is insoluble in pure water, since 25,000 parts of the water are required to dissolve one part of that substance. But we are to remember that rain-water invariably contains carbonic acid in solution, and in virtue of its presence exerts a power of dissolving carbonate of lime with considerable rapidity. It is the carbonic acid in rain-water which accounts for the invariable presence of carbonate of lime in considerable quantities in all spring

and well-water in calcareous districts, where either the chalk formation, or the older limestone rocks prevail. Carbonic acid forms chiefly two combinations with lime. One, which is insoluble, contains one equivalent of lime, and one of carbonic acid; and another, which is soluble, contains two equivalents of carbonic acid to one of lime. It is generally in virtue of the excess of carbonic acid, and the formation of bi-carbonate of lime, that water becomes hard. In speaking of hardness we ought to distinguish between permanent hardness and transient hardness. That which is caused by bi-carbonate of lime is removable to a great extent by boiling, but other mineral matters, such as sulphate of lime, or gypsum, impart to water a permanent hardness, which cannot be removed by simple boiling. Without laying down a definite rule I may state in a general manner that all water which contains more than 16 grains of lime to the gallon may be regarded as truly hard. For an account of the amount of lime contained in the water which is supplied by the different water companies for the use of the metropolis, I may refer you to a very excellent report of Professors Graham, Miller, and Hoffman, which gives detailed analyses of the quantities of lime and other mineral constituents. It there appears that most of the water used in London contains on the average not more than 20 to 25 grains of solid matter in the imperial gallon, and is therefore very serviceable for all ordinary purposes. In supplying water either to a town or to a private house we should endeavour as much as possible to hit upon the sample which, while it is sufficiently pleasant to the taste, is also useful for the kitchen and laundry, for there are hard waters which are excellent for drinking purposes, and yet unfit for cooking and washing. A large amount of carbonate of lime is by no means injurious to the health of man, and we have no evidence that sulphate of lime or gypsum, and other mineral matters that usually occur in drinking-waters, are deleterious. Hence, a water that is very hard, may still be very palatable, and even be preferred for drinking purposes to a softer one which is less sparkling and bright, and more tasteless.

The fourth and last quality that we esteem in water is coolness. Surface waters are invariably cold in winter and warm in summer—a peculiarity which, of course, we do not esteem; whilst water from deep springs has a uniform temperature, being, as compared with the temperature of the air, warm in winter and cold in summer. This uniformity of temperature further indicates a uniformity of composition. The reason of this is, that water of uniform temperature invariably has to descend through a dense mass of rock; and as it trickles slowly through the rock, it becomes saturated thoroughly with whatever it can dissolve; whilst water which finds its way into surface wells is liable to be altered in its composition by purely local circumstances. Thus we occasionally find the waters of surface wells very soft, and containing but very little of any impurity, either organic or mineral, in solution; whilst at other times the very same wells furnish water which is very rich in mineral matters and also contains much organic impurity. This is especially the case in summer; and the

difference is easily accounted for if we take into consideration how water usually collects in our springs. A surface well we can only have when a bed of clay comes near the surface, for this intercepts the surface water. In warm weather little or no water usually collects; and if the water found in a well is tolerably pure, it remains so for some time. During the summer months, however, there are probably accumulations of organic refuse matter around or near the well, and when a heavy fall of rain comes, it flushes them into the well. Hence we find, on examining the water after a heavy fall of rain, that it has a very different composition from that which it had before. Heavy showers of rain do not affect deep wells; and as by filtration through a considerable depth of soil the water is deprived of all injurious contamination, and as deep wells have a uniform temperature, a uniform coolness of water thus becomes an indirect indication of good quality in drinking-water.

In the next place, let me briefly allude to the qualities that we most esteem in

Water for Cooking and Washing.

Water for washing should be as free as possible from sulphate of lime, which causes hardness, neutralising in a great measure the soap, causing it to curdle, and destroying its detergent properties. It is undesirable to have much lime in water for cooking purposes, because with several organic constituents—for instance, legumin, the albuminous matter in peas and beans—it forms insoluble combinations, so that it is almost impossible to boil peas soft in hard water. Moreover water that contains much lime, on boiling throws down a white deposit, which prevents a proper extract being made from many articles of food, such as meat used to furnish soup, or tea. Very hard waters may be much improved for tea-making by adding a *little* bi-carbonate of soda.

Means of rendering Water Soft.

On a small scale we can effect this by the addition of a little carbonate of soda; but of course on a large scale this is inadmissible. In dealing with waters on a large scale they require to be purified, especially if we intend to make use of them in feeding our steam-boilers, because hard waters are the cause of steam-boiler deposits, which consist principally of carbonate and sulphate of lime. When water is boiled slowly and continuously, as in the steam-boiler, the carbonic acid is driven out, and the bi-carbonate becomes neutral, or insoluble carbonate of lime, which assumes a crystalline form, and accumulates in a stone-like mass at the bottom of the boiler, both injuring the metal, and creating a fearful risk of explosion.

Clarke's Water-purifying Process.

Fortunately we have in Dr. Clarke's process a very convenient safeguard. It consists simply in the addition of a certain quantity of lime-water, or even of powdered lime, to hard water. Strange as this remedy may appear at first sight its utility finds a ready explanation in the difference existing between the properties of the neutral or insoluble

carbonate of lime, and of the bi-carbonate or soluble carbonate of lime. Lime-water is simply a solution of quick-lime, or free lime in water; and when this free lime is added to the hard water containing bi-carbonate of lime, it enters into combination with the carbonic acid which previously held the carbonate of lime in solution. The original carbonate of lime, now rendered neutral, and that which is newly formed will then fall down together. This process has stood the test of experience, and answers very well; its only practical inconvenience is, that we have to provide tanks for the deposit which takes place in purifying hard water. But there is a process adopted at Woolwich for keeping boilers clean, which is very preferable to Clarke's purifying process.

The Woolwich Boiler-cleaning Process.

Caustic soda, a material largely manufactured for the use of glass-makers, has the effect of rendering water soft and preventing boiler incrustation. A small quantity (perhaps a half-pound once a-month for a large steam-boiler) suffices for this purpose. Its action very much resembles that of the lime in Clarke's purifying process: the soda takes up the additional quantity of carbonic acid that keeps the carbonate of lime in solution; the neutral carbonate of lime thus formed falls down, and the carbonate of soda remains in solution. It has this additional advantage over Clarke's process that when the water becomes somewhat concentrated by evaporation, the carbonate of soda precipitates the lime from sulphate of lime or gypsum. Having strongly recommended this simple material as affording the best remedy, I may safely pass by all other inferior processes.

The Action of Water on Leaden Pipes.

This subject has caused a good deal of unnecessary alarm. Lead, in the shape of soluble salts, is a highly injurious substance; and, as it is well known that certain waters act upon and dissolve it, fear is frequently entertained that water conveyed by leaden pipes may be contaminated with an amount of lead that will act injuriously upon the health of those who use it for drinking purposes. It is, therefore, a question of some importance to ascertain what the qualities of water are that act upon lead. The records of experience show incontestibly that water containing organic matter acts more rapidly upon lead than that which is free from such matter. From all the experience that is on record this follows incontestibly. In the next place, alkaline constituents (and there are some hard waters which contain a good deal of carbonate of soda or carbonate of potash) act in a special manner on leaden pipes. Hence we possess, in testing the alkalinity of water, at once the means of ascertaining whether or not it is likely to act upon leaden pipes. Even lime acts strongly upon lead. Salts of lime, carbonate and sulphate of lime especially, have, indeed, been considered protecting salts; but I have myself often examined waters which are very rich in carbonate and sulphate of lime, and yet act very strongly upon lead. It is true that soft waters often act upon lead very rapidly; but perhaps not so much by virtue of their softness, as on account of the presence of organic

matter and the absence of carbonic acid, which is a protection against the action of water on lead. In very soft waters we often find very little, sometimes almost a total absence of carbonic acid, and whenever this is the case the water acts upon lead. If you boil water and bring it in contact with clean lead, the latter is acted upon by it. Bright sparkling water, provided it is free from carbonate of soda, does not act upon lead. We have, then, three conditions which will account for the great action that some waters exercise upon lead. The first is, the presence of organic matters; secondly, the presence of alkaline salts or alkalies; and thirdly, the absence of carbonic acid. I would particularly impress upon you that there are soft waters which do not act upon lead, and that there are, on the other hand, hard waters that rapidly act upon lead.

In order to exhibit correctly the action of alkaline substances, I have here a piece of leaden pipe which has been brought into contact simply with mortar, and you will notice how the lime contained in the mortar acts upon the lead in the same way as the carbonate of soda which occurs sometimes in water, causing it to be converted into oxide of lead. The pipe itself has been converted almost entirely into litharge; indeed, it is worn into a thin film or sheet. It appears that all alkaline earths, like lime, have this effect, causing the lead to change rapidly into oxide of lead, which you will observe is an incrustation. I have analysed the sample I have in my hand, and I find it to be nearly pure litharge.

In laying down water-supply pipes, particular care should be taken not to put them in cement, for the lime acts upon the lead, but to surround them with gravel. Pipes are frequently eaten away in consequence of inattention to this point. Leaden tanks and water-cisterns are sometimes rapidly eaten away by the corrosive action of some waters. A very good protection is to throw in a few pieces of zinc, which is more readily attacked than lead: and as long as there is any zinc present the lead is saved from attack. When zinc is so employed the water may be used for feeding steam boilers, but is not to be recommended for drinking purposes. It is fortunate that, even when lead finds its way into the water it is removed by exposure to the air. Air contains carbonic acid, and in contact with carbonic acid the lead which has passed into the water becomes again precipitated. Carbonate of lead is insoluble, and filtration through an ordinary water-filter entirely deprives the water of its lead. The danger, then, of poisoning by lead, or by water containing lead, is very much less than is usually believed. Indeed, I do not think there is a single instance on record in which the presence of lead in water has proved injurious; for at the most only small quantites of lead can find their way into the water, and these again are rapidly and certainly removed by standing and by filtration.

Time does not admit of my making any observations on the qualities of water for irrigation; and there are so many points of practical importance connected with the subject, that perhaps it is as well I should defer that matter for a future occasion.

In the course of a discussion which ensued,

[illegible] drew attention to the remark of Dr. Voelcker,

that he did not think any persons had been injured by water taken out of leaden cisterns, and asked whether the Professor gave it as his positive opinion that leaden cisterns would not be subject to decomposition, if a good deal of free carbonic acid were placed in the water.

Dr. VOELCKER replied that it might attack the lead and corrode it; but the presence of carbonic acid was undoubtedly a safeguard.

Mr. FRERE wished to make an observation on the agricultural aspect of the question. Great interest had of late been manifested in the provision of better houses for agricultural labourers. Circumstances in general seemed so to concur, that the same spots upon which labourers were worst housed were also the most unfavourable for a supply of water. These places were frequently dependent upon land springs, which, as the Professor had stated, were most unsatisfactory sources of supply; and he thought that if a day were set apart for the special discussion of that branch of the subject, it would be of advantage to the whole agricultural community, and especially to the farm labourer. They would then require the aid not only of their Professor of Chemistry, but of men familiar with the geological aspects of our various clay strata, and men of practical experience in the making of ponds and reservoirs for retaining the water when supplies had been procured.

It had been suggested to him that zinc was now largely used for tanks in this town. He should like to know what the Professor thought of the use of such tanks.

Dr. VOELCKER said the effect was very similar to that which water exercised on lead, with this difference, that zinc got more easily eaten away by some kinds of water than even lead; he should think the water undesirable for drinking purposes.

A vote of thanks was then passed to Dr. Voelcker, who, in briefly acknowledging the compliment, observed that he could speak with some authority upon one point to which Mr. Frere had alluded. The bad quality of the water with which cottages were generally supplied in agricultural districts was really a hardship that pressed with peculiar severity upon the industrious and thrifty labourer; the man who did not visit the public-house, but stayed at home with his family, cultivated his garden, and kept a pig. Of course, where a pig was kept and a garden cultivated, there would be an accumulation of refuse organic matter which found its way into the surface well. Thus, the industrious man, who ought to be particularly encouraged, was particularly inconvenienced, and it might be, his life and that of his children endangered.

The CHAIRMAN said this was a matter of very great importance. In the parish in which he resided they not long ago brought the water down from a fine spring on the moors, and laid it on for the supply of the houses in the town and of the labourers' cottages. They were not dependent, therefore, upon any well. There was a constant supply of fresh, wholesome water kept up, and the advantage was very great over the surface well.

SELECT CLASSIFIED LIST OF AGRICULTURAL PATENTS FOR THE YEAR 1863.

[Compiled from the Commissioners of Patents' Journal.]

In this list such patents as originated in the year 1862, and were noticed in Vol. XXIV. of this Journal, are distinguished by having an asterisk (*) prefixed. The figures at the commencement of each item indicate the number of the patent on the official register.

The patents under each head are arranged alphabetically according to the name of the Inventor.

I. IMPLEMENTS USED IN THE VARIOUS PROCESSES OF CULTIVATION.

Ploughs.

1325. James Buckingham, of Launceston, Cornwall, *Improvements in Ploughs.* Application dated 26th May; provisional protection, 5th June; notice, 6th October, 1863.

689. W. E. Gedge (John Gedge and Son), of 11, Wellington-street, Strand, patent agent, *An improved Plough.* (*A communication from abroad by J. G. E. Clamageran, of La Lambertie, Gironde, France.*) Application dated 14th March; provisional protection, 3rd April, 1863.

3011. W. E. Gedge (J. Gedge and Son), of 11, Wellington-street, Strand, patent agent, *An improved Plough.* (*A communication from J. A. I. Pharisier, of Puy, France.*) Application dated 1st December; provisional protection, 11th December, 1863.

*3325. William Goulding, of Leicester, *Improvements in Ploughs.* Application dated 11th December, 1862; notice, 21st April; patent sealed, 2nd June, 1863.

427. Jesse Lee, of Church Gate, Leicester, *Improvements in Ploughs and Harrows.* Application dated 17th February; provisional protection, 27th February, 1863.

1372. James Mellard, of Rugeley, Staffordshire, agricultural implement manufacturer, *Improvements in double moulding or ridging ploughs.* Application dated 2nd June; provisional protection, 12th June, 1863.

1764. William Roberts, of Lylands Twyford, near Winchester, farmer, *Improvements in Ploughs.* Application dated 14th July; provisional protection, 24th July, 1863.

*3376. Leonard Salter, of Leigh, near Tunbridge, Kent, farmer, *Improvements in Ploughs.* Application dated 17th December, 1862; provisional protection, 9th January; notice, 21st April; patent sealed, 12th June, 1863.

839. Joseph Simmons, of Rainham, Sittingbourne, Kent, agricultural implement maker, *Improvements in Ploughs.* Application dated 22nd July; provisional protection, 7th August; notice, 1st December, 1863.

CULTIVATORS, DIGGERS, &c.

***2699.** T. Beards, of Stowe, Buckingham, *Improvements in machinery for cultivating land.* Application dated 6th October, 1862; patent sealed, 6th April, 1863.

1884. J. W. Branford, of March, Cambridgeshire, merchant, *Improvements in apparatus for hoeing and cleaning the land, and for cutting or setting out the plants of root crops at certain distances from each other, and which invention he designates "A longitudinal and transverse hoe."* Application dated 30th July; provisional protection, 21st August; notice, 15th December, 1863.

*2501. R. A. Brooman, of 166, Fleet-street, London, patent agent, *Improvements in implements for cultivating the soil. (A communication from France.)* Application dated 11th September; provisional protection, 3rd October, 1862; notice, 13th January; patent sealed, 6th March, 1863.

2676. O. C. Evans, citizen of America, now resident in Manchester, *Improvements in digging machinery.* Application dated 29th October; provisional protection, 13th November; notice, 8th December, 1863.

2129. Charles Harratt, of Hornsey-lane, Highgate, Middlesex, *Improvements in apparatus for tilling land.* Application dated 28th August; provisional protection, 18th September; notice, 20th October; patent sealed 4th December, 1863.

*3216. John Irwin, of Wellingborough, Northamptonshire, *An improved machine for cultivating land.* Application dated 1st December; provisional protection, 12th December, 1862; notice, 7th April, patent sealed, 12th May, 1863.

*3090. Charles Littleboy, of Straffan, county Kildare, Ireland, land steward, *Improvements in implements for cultivating land.* Application dated 17th November; provisional protection, 5th December, 1862; notice, 10th March; patent sealed, 5th May, 1863.

1033. J. P. and E. B. Nunn, of Royston, Cambridgeshire, farmers, *Improvements in hoes and cultivators.* Application dated 25th April; provisional protection, 22nd May; notice, 2nd June; patent sealed, 23rd October, 1863.

580. A. F. Pagny, of Paris, gentleman, *A new agricultural implement called "Billon-Roule," for cultivating tubercles, roots, and all oil plants.* Application dated 3rd March; provisional protection, 17th April; notice, 7th July; patent sealed, 29th August, 1863.

2918. James Platt, of Gloucester, engineer, *Improvements in machinery and apparatus for cultivating land.* Application dated 23rd November, 1863.

545. Michael Puddefoot, of Blisset-street, Greenwich, hat manufacturer, *Improvements in implements for tilling and cultivating land.* Application dated 26th February; provisional protection, 10th March; notice, 7th July, 1863.

1404. Joseph Seaman, of Lowesmoor Works, Worcester, agricultural implement manufacturer, *Improvements in implements to be used in the cultivation of the soil.* Application dated 5th June; provisional protection, 26th June; notice, 13th October; patent sealed, 1st December, 1863.

2351. William Woofe, of Gloucester, agriculturist, *Improvements in implements for tilling the soil, and in means of drawing ploughs and other*

implements for tilling through the land. Application dated 2 September; provisional protection, 9th October, 1863.

ENGINES AND APPARATUS FOR STEAM CULTIVATION.

2128. John Alison, of Reigate, Surrey, gentleman, *Improvements in appar for tilling land, which improvements are chiefly applicable u steam power is employed.* Application dated 28th August; visional protection, 11th September; notice, 22nd September; pa sealed, 10th November, 1863.

2513. John Fowler, of Leeds, engineer, *Improvements in apparatus hauling agricultural implements.* Application dated 13th Octol provisional protection, 23rd October, 1863.

1726. R. Hornsby, junr., J. Bonnall, and W. Astbury, all of Spitalgate Works, Grantham, Lincolnshire, *Improvements in traction eng and in apparatus for ploughing and tilling lands by steam and power, part of which improvements is also applicable to drivin giving motion to machinery.* Application dated 10th July; provisi protection, 24th July; notice, 4th August; patent sealed, September, 1863.

880. James Howard, E. T. Bousfield, and J. Pinney, of Bedford, engin *Improvements in steam engines, and in the means of applying same to the tilling of land, also in apparatus to be used with engines in the tilling of land.* Application dated 7th April; visional protection, 24th April; notice, 28th April; patent sea 2nd June, 1863.

1379. Etienne Joseph Jarry, of 29, Boulevart St. Martin, Paris, merch *Improvements in machinery to be worked by steam or other po for clearing and ploughing land.* Application dated 2nd Ju provisional protection, 3rd July; patent sealed, 13th November, 1

*3156. W. H. Samson, of Underhill, Wittersham, Kent, *Improvement machinery for cultivating land by steam power.* Application d 27th December, 1862; provisional protection, 9th January, 1863

688. William Smith, of Little Woolstone, Bucks, farmer, *Improvement machinery for cultivating land and sowing seed.* Application d 13th March; provisional protection, 27th March; notice, 31st Ma patent sealed, 27th May, 1863.

2614. Frederick Tolhausen, of 17, Faubourg Montmartre, Paris, civil e neer and patent agent, *An improved steam cultivator. (A munication from the Marquis Emmanuel de Ponçins, Feurs L France.)* Application dated 25th September; provisional protect 17th October, 1862; notice, 27th January; patent sealed, March, 1863.

3126. Thomas Webb, of Smallwood Manor, Uttoxeter, Staffordshire, *provements in engines for hauling agricultural implements, and in traction engines.* Application dated 11th December, 1863.

TRACTION ENGINES, &c.

61. Thomas Aveling, of Rochester, engineer, *Improvements in the construc of traction engines.* Application dated 7th January; provisi protection, 30th January; notice, 5th May; patent sealed, June, 1863.

137. G. A. Barrett, W. Exall, C. J. Andrews, and A. Barrett, of Rea engineers, *Improvements in valves and apparatus for regula*

steam-engines. (A communication in part from America.) Application dated 2nd June; patent sealed, 27th November, 1863.

756. George Arthur Biddell, of Ipswich, Suffolk, mechanical engineer, *Improvements in locomotives, usually called "traction engines," to be used on common roads.* Application dated 21st March; provisional protection, 17th April; notice, 19th May; patent sealed, 18th September, 1863.

1482. Robert Blackburn, of Exeter, engineer, *Improvements in traction engines.* Application dated 13th June; provisional protection, 17th July; notice, 20th October; patent sealed, 12th December, 1863.

357. David Law and John Downie, of Glasgow, engineers, &c., *Improvements in traction engines or common road locomotives.* Application dated 9th February; provisional protection, 20th February; notice, 9th June; patent sealed, 4th August, 1863.

1538. Augustin Morel, of Roubaix, France, manufacturer, *Improvements in traction engines.* Application dated 19th June; provisional protection, 3rd July; notice, 27th October; patent sealed, 12th December, 1863.

*2480. Fraser Selby, of Surbiton, Surrey, engineer, *Improvements in traction engines and valves for ditto.* Application dated 9th September, 1862; notice, 20th January; patent sealed, 6th March, 1863.

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*3252. James Braddock, of Droylesden, Lancashire, engineer, *Certain improvements in machinery or apparatus for effecting the separation of impurities from the water employed in steam-boilers, and also for effecting the circulation of the said water.* Application dated 4th December, 1862; notice, 3rd March; patent sealed, 2nd June, 1863.

2808. J. H. Johnson, of 47, Lincoln's Inn Fields, Middlesex, *Improvements in the prevention or removal of incrustation in or from steam-generators. (A communication to him from France.)* Application dated 17th October, 1862; patent sealed, 9th April, 1863.

*2028. Alexander Leslie, of Turiff, Aberdeenshire, N. B., farmer, *Improvements in apparatus for applying steam or other motive power to cultivate the soil and to actuate wheeled carriages.* Application dated 15th July; provisional protection, 25th July; notice, 18th November, 1862; patent sealed, 13th January, 1863.

896. George Spencer, of No. 2, Lausanne Villas, Queen's-road, Peckham, Surrey, civil engineer, *Improvements in preventing incrustation in steam-engine boilers.* Application dated 6th April; patent sealed, 2nd October, 1863.

106. C. H. Townsend and Jas. Young, of Bristol, engineers, *Improvements in composition for preventing incrustation and corrosion in steam-boilers and condensers.* Application dated 13th January; provisional protection, 23rd January; notice, 26th May; patent sealed, 10th July, 1863.

*2583. James Wilson, of North Brixton, in the county of Surrey, warehouseman, for an invention of *An improved composition for preventing and removing incrustation in boilers.* Application dated 20th September, 1862; patent sealed 17th March, 1863.

HARROWS.

2452. C. P. Button, 27, Leadenhall-street, City of London, merchant, *Improvements in harrows.* (*A communication from W. D. Sperry, of Cleveland, U. S.*) Application dated 7th October; provisional protection, 16th October, 1863.

995. W. C. Cambridge, of Bristol, agricultural implement-maker, *Improvements in the construction of harrows.* Application dated 21st April; provisional protection, 22nd May; notice, 18th August; patent sealed, 2nd October, 1863.

630. Charles Clay, of Walton Grange, Wakefield, *Improvements in chain-harrows.* Application dated 5th March; provisional protection, 20th March; notice, 7th July, 1863.

2391. John Cooper, of Ipswich, agricultural implement-maker, *Improvements in the construction of harrows.* Application dated 29th September; provisional protection, 9th October, 1863.

1672. A. and B. S. Gower, of Market Drayton, Shropshire, agricultural engineers, *An improved sowing and harrowing machine.* Application dated 6th July; provisional protection, 24th July; notice, 13th October; patent sealed, 17th December, 1863.

1827. George Haseltine, 12, Southampton-buildings, Middlesex, civil engineer, *An improved implement for harrowing and smoothing land.* (*A communication from John Kelsey, of Yardbyville, U. S.*) Application dated 21st July; provisional protection, 7th August; notice, 24th November, 1863.

2752. Robert Sellar, of Huntley, Aberdeenshire, agricultural implement manufacturer, *An improvement in the construction of harrows.* Application dated 6th November; provisional protection, 27th November, 1863.

*2803. John Summerton, of Smethwick, Staffordshire, agricultural machinist *Improvements in harrows for harrowing land.* Application dated 17th October, 1862; notice, 24th February; patent sealed, 14th April, 1863.

83. William Tasker, jun., of Andover, *Improvements in the construction of harrows.* Application dated 9th January; provisional protection, 6th March; notice, 28th April; patent sealed, 16th June, 1863.

HORSE-RAKES, &c.

*2646. Joseph Bucknall, of Boston, Lincolnshire, mechanic, *Improvements in the construction of horse-hoes.* Application dated 30th September, 1862; notice, 13th January; patent sealed, 27th February, 1863.

1368. John Davey, of Crafthole, Cornwall, agricultural implement-manufacturer, *Improvements in horse-rakes.* Application dated 1st June; provisional protection, 12th June, 1863.

1849. T. Perkins, of Hitchen, Herts; ironmonger, *Improvements in horse-rakes and hand-rakes.* Application dated 23rd July; provisional protection, 14th August, 1863.

*3318. Isaac Spight, of Glandford Briggs, Lincolnshire, agricultural machine-maker, *Improvements in horse-hoes.* Application dated 11th December, 1862; provisional protection, 2nd January; notice, 24th March; patent sealed, 5th June, 1863.

911. J. Wightman and C. Dening, of Chard, Somerset, agricultural implement-makers, *Improvements in horse-rakes.* Application dated 10th April; provisional protection, 1st May, 1863.

2833. W. J. Williams, of No. 51, Dorset-street, Salisbury-square, Middlesex, *Improvements in the construction of field-rakes for agricultural purposes. (A communication in part from U. S. America.)* Application dated 27th October, 1862; notice, 24th February; patent sealed, 21st April, 1863.

CLOD-CRUSHER.

*2364. Joseph and Benjamin Harrison, of Otley, Yorkshire, farmers, *Improvements in clod-crushers.* Application dated 26th August; provisional protection, 19th September, 1862; patent sealed, 20th February, 1863.

SEED AND MANURE DRILLS, DISTRIBUTORS, &c.

1359. John Heard, of Crediton, Devon, *Improvements in apparatus for distributing manure.* Application dated 30th May; provisional protection, 3rd July, 1863.

1698. Thomas Preece, of Leominster, Herefordshire, implement-maker, *An improved corn and seed-drill.* Application dated 8th July; provisional protection, 6th November; notice, 17th November, 1863.

929. Robert Reeves, of Bratton, Wilts, *Improvements in the manufacture of liquid-manure drills.* Application dated 13th April; provisional protection, 1st May; notice, 9th June; patent sealed, 21st July, 1863.

359. Henry and John Smith, of Bury St. Edmunds, Suffolk, implement-makers, *Improvements in drills or machines for depositing seed and manure.* Application dated 9th February; provisional protection, 20th February, 1863.

2861. John Walmsley, of the town of Berlin, province of Canada, farmer, *Improvements in machinery for pulverizing and cleaning the soil, and scattering seed, guano, bone-dust, and other substances thereon.* Application dated 14th November; provisional protection, 27th November, 1863.

MISCELLANEOUS IMPLEMENTS FOR COMBINED OPERATIONS.

1370. Charles Belcher, of Little Coxwell, Berks, farmer, *Improvements in cutting and transplanting turf and in apparatus to be employed therein, which apparatus is also applicable to the extraction of weeds, and to the planting of seeds, roots, sets, or plants.* Application dated 1st June; provisional protection, 12th June; notice, 13th October, 1863.

3223. John Green, of Newtown Farm, in the parish of St. Martin, Worcestershire, agriculturist, *Improvements in the construction of harrows, cultivators, and ploughs.* Application dated 21st December, 1863.

1473. Robert Hughes, of Worcester, road surveyor, *An improved implement or apparatus for scraping and sweeping turnpike and other highways, carriage-drives, and footwalks, or other places requiring to be so cleaned.* Application dated 12th June; provisional protection, 3rd July; notice, 20th October; patent sealed, 8th December, 1863.

807. John King, of Chadshunt Farm, near Kineton, and Thomas H Marshall, of Combrooke, Warwick, *Improvements in machinery apparatus for preparing land for seed, and for harrowing, an fencing land.* Application dated 27th March; provisional protec 24th July; notice, 28th July; patent sealed, 11th Septem 1863.

754. F. and A. Roberts, of Gloucester, *Improvements in agricultural in ments, and in apparatus for working the same.* Application d 21st March; provisional protection, 3rd April; notice, 7th A patent sealed, 18th September, 1863.

II. HARVESTING MACHINES, &c.

Mowing and Reaping Machines.

2212. Louis Adam, of Moscow, Russia, merchant, *An improved machin mowing grass or reaping grain.* Application dated 8th Septen 1863.

874. A. C. Bamlett, of Ripon, Yorkshire, agricultural engineer, *Imp ments in reaping and mowing machines.* Application dated April; provisional protection, 17th April; notice, 18th Aug patent sealed, 2nd October, 1863.

751. J. Brigham and R. Bickerton, of Berwick-upon-Tweed, implen makers, *Improvements in reaping or mowing machines.* Applic dated 20th March; provisional protection, 22nd May; notice, July; patent sealed, 11th September, 1863.

2339. J. Brigham and R. Bickerton, of Berwick-on-Tweed, implen makers, *Improvements in reaping or mowing machines.* Applic dated 22nd September; provisional protection, 2nd October, 186

2695. J. Brigham and R. Bickerton, of Berwick-on-Tweed, implen makers, *Improvements in reaping and mowing machines.* Ap tion dated 30th October, 1863; provisional protection, 13th Noven notice, 24th November, 1863.

1574. C. T. Burgess, of Gower-street, Middlesex, *Improvements in rea machines.* Application dated 22nd June; provisional protec 3rd July; notice, 21st July; patent sealed, 11th September, 18

2329. C. T. Burgess, of Upper Gower-street, Middlesex, *Improvemen reaping-machines.* Application dated 21st September; provis protection, 9th October, 1863.

3095. W. McIntyre Cranston, of No. 77, Upper Thames-street, Lo *Improvements in reaping and mowing machines. (A communica from William Anson Wood, United States of America).* Applic dated 8th December; provisional protection, 18th December, 18

260. Henry Crichley, of Birmingham, ironfounder, *Improvements in rea and mowing machines. (A communication to him from abroa Robert Bodington, of Melbourne, Australia.)* Application dated January; provisional protection, 6th February; notice, 2nd J patent sealed, 17th June, 1863.

1001. Theodore Grace, of Bristol, agricultural engineer, *Improvement reaping and mowing machines.* Application dated 22nd A provisional protection, 22nd May, 1863.

1984 William Gray, of Brownrigg, Haddingtonshire, N. B., farmer, *provements in certain parts of reaping-machines, and in the wor*

or application of the same. Application dated 11th August; provisional protection, 21st August; notice, 8th December, 1863.

1761. R. Hornsby and J. E. Phillips, of Spittlegate Iron Works, Grantham, *Improvements in reaping and mowing machines.* Application dated 14th July; provisional protection, 7th August; notice, 18th August; patent sealed, 25th September, 1863.

1503. William Mainwaring, of Banbury, engineer, *Improvements in harvesting-machines.* Application dated 16th June; provisional protection, 3rd July; notice, 29th September; patent sealed, 1st December, 1863.

1188. W. Mattison and G. Barker, of Leeming Bar, near Bedale, Yorkshire, ironfounders, *Improvements in grass-mowing and reaping-machines.* Application dated 12th May; provisional protection, 22nd May, 1863.

2055. C. H. McCormick, of Chicago, U. S. America, manufacturer, *Improvements in reaping-machines.* Application dated 18th August; provisional protection, 4th September; notice, 8th September, 1863.

1090. E. Mitchell, of Fareham, Hampshire, *Improvements in reaping and mowing machines.* Application dated 30th April; provisional protection, 15th May; notice, 2nd June; patent sealed, 10th July, 1863.

78. David Ball Parsons, formerly of New York, U. S., now of 77, Upper Thames-street, London, *Improvements in reaping and mowing machines. (A communication in part from abroad.)* Application dated 9th January; provisional protection, 23rd January, 1863.

598. David Ball Parsons, now of 77, Upper Thames-street, London, *Improvements in reaping and mowing machines. (A communication in part from abroad by W. A. Wood, of New York, U. S. America.)* Application dated 3rd March; provisional protection, 20th March; notice, 2nd June; patent sealed, 14th July, 1863.

*2218. R. W. Ralph, of Honnington-Grange, near Newport, Salop, *Improvements in reaping-machines.* Application dated 7th August; notice, 9th December, 1862; patent sealed, 30th January, 1863.

21. Robert C. Ransome, of Ipswich, agricultural engineer, *Improvements in reaping-machines. (A communication from Warsaw.)* Application dated 2nd January; notice, 12th May; patent sealed, 30th June, 1863.

3031. James Shanks, of Abroath, county Forfar, N. B., machinist, *Improvements in mowing-machines.* Application dated 10th November, 1862; notice, 17th March; patent sealed, 5th May, 1863.

810. Reuben Sims (Picksley, Sims, and Co.), Bedford Foundry, Leigh, Lancashire, agricultural implement-makers, *Improvements in reaping and mowing machines.* Application dated 28th March; provisional protection, 10th April, 1863.

2169. Reuben Sims (Picksley, Sims, and Co.), Bedford Foundry, Leigh, Lancashire, engineer, *Improvements in reaping and mowing machines.* Application dated 2nd September; provisional protection, 2nd October, 1863.

1248. C. Barnard, J. Bishop, C. Barnard, jun., and G. Barnard, of the Norfolk Iron-Works, Norwich, engineers, *Improvements in lawn mowing and*

rolling machines. Application dated 19th May; provisional tection, 5th June; notice, 9th June; patent sealed, 6th Novem 1863.

3092. J. E. Boyd, of Lewisham, Kent, gentleman, *Improvements in l mowing and grass-cutting machines. (Partly a communication f H. Fisher, of Alliance, Ohio, U. S.)* Application dated 8th Decem 1863.

2397. E. W. Bullard, of Massachusetts, U. S., *A new and useful mac or carriage for turning and spreading hay, and for other useful a cultural purposes.* Application dated 30th September; protec on complete specification, 9th October; patent sealed, 24th Novem 1863.

1022. John Cornes and John Coope Davis, both of Ilford, Essex, *Impr ments in lawn mowing, rolling, and collecting-machines.* App tion dated 24th April; provisional protection, 8th May; notice, September; patent sealed, 23rd October, 1863.

2785. George Ryder and Matthew Gutteridge, of Leicester, *Improvemen haymaking-machines.* Application dated 9th November; provisi protection, 20th November, 1863.

1873. D. Taylor, of Bonchester Bridge, Roxburgh, N. B., joiner, *Impr ments in ventilating hay, corn, and other ricks.* Application d 28th July; provisional protection, 14th August, 1863.

THRASHING-MACHINES.

2733. William Audinwood, of Castle Donington, Leicestershire, *Impr ments in thrashing-machines.* Application dated 4th Novem provisional protection, 27th November, 1863.

1671. G. A. Barrett, W. Exall, C. J. Andrewes, and A. Barrett, of Reac Berks, engineers, and J. L. Bowhay, of Modbury, Devon, *Impr ments in the arrangement and construction of fixed and por combined thrashing-machines.* Application dated 4th July; pr sional protection, 31st July; notice, 10th November; patent se 29th December, 1863.

1058. Henry Beare, of Newton Abbot, Devon, agricultural implem maker, *Improvements in machines for thrashing out corn from straw, part of which is applicable for combing the straw.* Applic dated 27th April; provisional protection, 8th May; notice, June; patent sealed, 29th August, 1863.

2033. Edward Hammond Bentall, of Heybridge, near Maldon, Essex, agr tural implement-maker, *Improved machinery for thrashing corn other grain or seeds.* Application dated 15th August; provis protection, 4th September; notice, 24th November, 1863.

2921. Thomas Brinsmead, of St. Giles-in-the-Wood, near Torrington, *provements in apparatus for thrashing and reeding wheat and straw.* Application dated 20th November; provisional protec 11th December, 1863.

270. Nathaniel Clayton and Joseph Shuttleworth, of Stamp End W Lincoln, *Improvements in thrashing-machines.* Application d 29th January; provisional protection, 6th February; notice, February; patent sealed, 21st April, 1863.

*3212. H. L. Emery, of Albany, U. S., now of 72, Sloane-street, Ch Middlesex, agricultural implement-maker, *Improvements in thras*

machines. Application dated 1st December; provisional protection, 12th December, 1862; notice, 14th April; patent sealed, 27th May, 1863.

2027. F. Flavell, of Welton, near Daventry, in the county of Northamptonshire, machinist, *Improvements in shakers for thrashing-machines.* Application dated 15th August; provisional protection, 4th September; notice, 22nd December, 1863.

558. William Gray, of Sheffield, machine-knife manufacturer, *Improvements in the manufacture of beaters for thrashing-machines.* Application dated 27th February; provisional protection, 20th March; notice, 26th May; patent sealed, 30th June, 1863.

1607. J. Head and H. Brinsmead, of Ipswich, Suffolk, *Improvements in machinery applicable to thrashing-machines, and for cutting and bruising straw.* Application dated 25th June; provisional protection, 31st July, 1863.

1758. James, Thomas, and F. R. Holmes, of Norwich, agricultural engineers, *Improvements in thrashing and dressing machines.* Application dated 14th July; provisional protection, 24th July; notice, 18th August; patent sealed, 23rd October, 1863.

1472. Thomas Hughes Milner, of Edinburgh, N. B., gentleman, *Improvements in thrashing-machines. (A communication to him from William Roberts, Melbourne, machine-maker.)* Application dated 12th June; provisional protection, 3rd July, 1863.

1042. W. E. Newton, of 66, Chancery-lane, Middlesex, civil engineer, *Improvements in thrashing-machines, part of which improvements are also applicable for hulling, decorticating, cleaning, and polishing grains and seeds. (A communication from A. Barbier and N. E. Daubrée, both of Clermont, France.)* Application dated 25th April; provisional protection, 8th May; notice, 1st September; patent sealed, 2nd October, 1863.

620. E. P. Plenty and W. Pain, of Newbury, Berkshire, agricultural engineers, *An improved method of supporting screens and straw-shakers, specially applicable to thrashing-machines.* Application dated 6th March; provisional protection, 27th March, 1863.

1718. William Tasker, junr., of Andover, agricultural engineer, *Improvements in thrashing-machines.* Application dated 9th July; provisional protection, 24th July; notice, 17th November, 1863.

*2563. Thomas Watts, of Carisbrooke, Isle of Wight, *Improvements in combined thrashing-machines.* Application dated 19th September; provisional protection, 10th October, 1862; notice, 20th January; patent sealed, 3rd March, 1863.

2272. B. J. Webber, of Newton Abbot, Devon, *Improvements in thrashing-machines.* Application dated 18th September; provisional protection, 25th September, 1863.

2706. John Wilson, of Upper Poppleton, Yorkshire, *Improvements in thrashing-machines.* Application dated 31st October; provisional protection, 20th November, 1863.

STRAW AND GRAIN ELEVATORS, &c.

·3101. Henry Audinwood, of Weston-upon-Trent, Derbyshire, engineer, *Improvements in raising or removing grain from one place to another.*

Application dated 9th December; provisional protection, 18th December, 1863.

1514. John Banwell, of Watlington, Oxfordshire, *A combined machine for collecting and placing in rows, or collecting and elevating into a waggon or elsewhere, hay, corn, or other agricultural produce.* Application dated 17th June; provisional protection, 3rd July; notice, 27th October; patent sealed, 17th December, 1863.

923. Charles Atkins Collins, of Trowbridge, Wilts, gentleman, *An improved method and apparatus for loading carts and waggons with hay, straw, and other similar products.* Application dated 11th April; provisional protection, 1st May; notice, 18th August; patent sealed, 2nd October, 1863.

1910. T. Fellowes and H. Hemfrey, of Spalding, Lincolnshire, *Improvements in apparatus for elevating straw and other agricultural produce.* Application dated 1st August; provisional protection, 14th August; notice, 15th December, 1863.

2167. Robert Young, of Glasgow, N. B., millwright, *Improvements in separating and elevating apparatus for grain or granular matters.* Application dated 2nd September; provisional protection, 25th September, 1863.

APPARATUS FOR PRESERVING, CLEANING, AND DRYING GRAIN, &c.

822. Wilson Ager, of the City of New York, U. S., engineer, *Improvements in machinery or apparatus for cleaning and decorticating grain.* Application dated 30th March, 1863.

262. Henri Adrien Bonneville, patent agent, Paris, *Improvements in the construction of granaries. (A communication from Louis Jean Gustave de Connick, merchant, 24, Rue de Mont Thabor, Paris.)* Application dated 29th January; provisional protection on complete specification, 6th February; notice, 14th April; patent sealed, 19th May, 1863.

2926. H. A. Bonneville, patent agent, 38, Porchester-terrace, Bayswater, *Improvements in preserving grain, flour, and other similar substances, and in the apparatus connected therewith. (A communication from Alphonse Louvel, M.D., of Saint Denis, near Paris.)* Application dated 20th November; protection on complete specification, 27th November; notice, 15th December, 1863.

1367. L. S. Chichester, of Brooklyn, New York, U. S., *Improvements in means for drying grain.* Application dated 1st June; provisional protection, 3rd July; notice, 7th July; patent sealed, 23rd October, 1863.

191. Nathaniel Clayton and Joseph Shuttleworth, of Lincoln, *Improvements in rotatory screens suitable for screening wheat and other grain or seed.* Application dated 21st January; provisional protection, 13th February; patent sealed, 21st April, 1863.

857. J. Prosper Hanrez, of Marchiennes au Pont, Belgium, *Improved machinery or apparatus for drying and cooling grain and other substances.* Application dated 4th April; provisional protection, 1st May; notice, 11th August; patent sealed, 25th September, 1863.

737. H. O. Haughton, of Liverpool, *Improvements in machinery for drying and cooling grain and seeds. (A communication from abroad by J. B. Wheeler and S. Losee, both of New York, U. S.)* Application

dated 19th March; provisional protection, 31st July; notice, 4th August; patent sealed, 11th September, 1863.

876. John Henry Johnson, of 47, Lincoln's Inn Fields, Middlesex, gentleman, *Improvements in machinery or apparatus for drying grain, applicable also to the manufacture of malt.* (*A communication from Canada.*) Application dated 7th April; provisional protection, 24th April, 1863.

1066. J. H. Johnson, of Lincoln's Inn Fields, *Improvements in drying and cooling grain, and in the machinery or apparatus employed therein.* (*A communication from W. H. Sutton and J. J. Gibson, both of Brantford, county of Brant, Canada, dated 28th April,* 1863.) Application dated 28th April; provisional protection, 15th May; notice, 4th August; patent sealed, 11th September, 1863.

135. L. P. Josse, of Paris, gentleman, *Improvements in apparatus for cleansing wheat, or other grain or seeds.* Application dated 15th January; provisional protection, 30th January; notice, 26th May; patent sealed, 3rd July, 1863.

2534. F. A. E. G. de Massas, of Hoxton, Middlesex, civil engineer, *Improvements in smut-machines, and in machines for cleansing and peeling grain and seeds.* Application dated 16th October; provisional protection, 30th October, 1863.

*2959. William Edward Newton, of 66, Chancery-lane, Middlesex, civil engineer, *Improved apparatus for drying grain and other substances.* (*A communication from P. C. Schuyler, of New York City.*) Application dated 1st November, 1862; patent sealed, 13th April 1863.

1226. John Patterson, of Beverley, Yorkshire, engineer, *Improvements in machinery or apparatus for grinding, crushing, cleaning, and hulling or shelling various kinds of farm or vegetable produce, also applicable to the crushing or grinding of minerals and other substances.* Application dated 15th May; provisional protection, 5th June; notice, 22nd September; patent sealed, 10th November, 1863.

699. James Walworth, of Bradford, Yorkshire, corn-mill machine maker, *Improvements in machinery or apparatus for washing or cleansing and drying Egyptian wheat, beans, and other kinds of grain or seeds.* Application dated 14th March; provisional protection, 3rd April; notice, 21st July; patent sealed, 10th September, 1863.

971. Bernard James Webber, of Newton Abbott, Devon, engineer, *Improvements in apparatus for separating corn from the ears, and for combing straw.* Application dated 17th April; provisional protection, 22nd May; notice, 18th August; patent sealed, 25th September, 1863.

2602. John Weems, of Johnstone, Renfrew, North Britain, engineer, *Improvements in machinery, apparatus, or means for drying, cleaning, and cooling grain and other vegetable products.* Application dated 22nd October; provisional protection, 13th November, 1863.

727. Benjamin Wren, of Stockton-upon-Tees, Durham, corn-miller, *Improvements in cleansing and treating certain descriptions of wheat and other grain.* Application dated 18th March; provisional protection, 17th April; notice, 21st July; patent sealed, 11th September, 1863.

Measuring and Weighing Apparatus.

1216. L. S. Chichester, of Brooklyn, U. S., *Improvements in machinery for weighing grain.* Application dated 14th May; patent sealed, 4th August, 1863.

*2088. Thomas King, of Truman's Brewery, Spitalfields, Middlesex, *Improvements in apparatus for measuring malt, grain, and other granular substances.* Application dated 22nd July; provisional protection, 1st August; notice, 25th November, 1862; patent sealed, 13th January, 1863.

Carts and other Vehicles.

1106. J. B. Dubreuil, of Paris, gentleman, *Improvements in carts, waggons, and other vehicles.* Application dated 2nd May; provisional protection, 15th May; notice, 11th August, 1863.

*2278. J. H. Johnson, of 47, Lincoln's Inn Fields, Middlesex, gentleman, *Improvements in carts and other vehicles.* (*A communication from France.*) Application dated 13th August; provisional protection, 22nd August, 1862; patent sealed, 21st January, 1863.

Horse-Power Machines.

2809. George Haseltine, of 12,' Southampton-buildings, civil engineer, *Improvements in endless chain horse-powers.* (*A communication from S. Perry, of Newport, U. S. America.*) Application dated 11th November; provisional protection, 20th November, 1863.

1701. George Haseltine, 12, Southampton-buildings, Chancery-lane, *Improvements in lever horse-power machines, the cog-gearing employed being applicable to other machines.* (*A communication from Cyrus Avery, of Philadelphia, Pennsylvania, U. S.*) Complete specification, 8th July; protection granted, 17th July; notice, 21st July; patent sealed, 2nd October, 1863.

III. FARM, STABLE, DAIRY, GARDEN, AND OTHER IMPLEMENTS, PROCESSES, &c.

Chaff-cutters, &c.

*2160. Benjamin Bailey, of Leicester, machinist, *Improvements in apparatus for cutting chaff, &c., which are also applicable to mowing short or lawn grass.* Application dated 30th July; provisional protection, 8th August; notice, 2nd December, 1862; patent sealed, 21st January, 1863.

2730. Abram Gillett, of Highway Farm, Berks, engineer, *Improvements in machines for cutting chaff and such like substances.* Application dated 4th November; provisional protection, 20th November, 1863.

2993. Thomas Lane, of Cirencester, Gloucestershire, implement-maker, *Improvements in chaff-cutting machinery.* Application dated 28th November; provisional protection, 11th December, 1863.

927. Robert Leggett, engineer, and Robert Gittus, farmer, both of Mildenhall, Suffolk, *Improvements in the construction of machinery or apparatus for cutting chaff and other agricultural produce.* Application dated 13th April; provisional protection, 1st May; notice, 16th June; patent sealed, 2nd October.

518. Robert Maynard, of Whittlesford, Cambridgeshire, *Improvements in portable chaff-cutting machines.* Application dated 27th February; provisional protection, 20th March; notice, 9th June; patent sealed, 28th July, 1863.

2199. Nathan Singleton, of Manchester, commission agent, *Certain improvements in machinery or apparatus for cutting hay, straw, or other similar agricultural produce. (A communication from Heinrich Pollack, of Hamburg.)* Application dated 7th September; provisional protection, 25th September, 1863.

CUTTING AND PULPING MACHINES.

120. George A. Biddell, of Ipswich, mechanical engineer, *Improvements in machines for pulping turnips and other vegetable substances.* Application dated 14th January; provisional protection, 23rd January; notice, 19th May; patent sealed, 23rd June, 1863.

*3259. Richard Hornsby, junior, of Grantham, Lincolnshire, *Improvements in apparatus for cutting and pulping turnips and other vegetables.* Application dated 4th December, 1862; patent sealed, 27th February, 1863.

1561. Joseph Sainty, Burnham Market, Norfolk, agricultural implement-maker, *Improvements in turnip-cutters for cutting the last slice.* Application dated 22nd June; provisional protection, 21st July, 1863.

3234. John Sainty, of Burnham Market, Norfolk, agricultural implement-manufacturer, *An improved turnip-cutter for cutting the last slice.* Application dated 22nd September, 1863.

2124. John Shaw, of New Wortley, Leeds, implement-maker, *Improvements in machines for cutting or reducing turnips or other roots as food for animals.* Application dated 28th August; provisional protection, 11th September; notice, 22nd September, 1863.

*2374. Reuben Sims (Picksley, Sims, and Company), the Bedford Foundry, Leigh, Lancashire, agricultural implement-makers, *Improvements in machinery or apparatus for pulping, stripping, or slicing turnips and other vegetable substances.* Application dated 27th August, 1862; patent sealed, 20th February, 1863.

*3026. John Whittaker, of Leigh, Lancashire, agricultural implement-maker, *Improvements in machinery or apparatus for pulping, stripping, and slicing edible roots for cattle.* Application dated 10th November, 1862; notice, 17th March; patent sealed, 5th May, 1863.

APPARATUS FOR SEPARATING AND SIZING ROOTS.

1130. S. Hibbert, J. Lawton, and J. Kay, of Manchester, *Certain improvements in apparatus for cleansing potatoes and in decorticating the same and other esculent roots.* Application dated 6th May; provisional protection, 15th May; notice, 1st September; patent sealed, 2nd November, 1863.

480. Herbert Mackinder, of Mere Hall, Lincoln, for an invention of *Improvements in apparatus for separating potatoes into different sizes.* Application dated 21st February; provisional protection, 6th March; notice, 16th June; patent sealed, 21st July, 1863.

724. Francis Richmond, Henry Chandler, and James Gadsby Richmond, of Salford, Lancashire, agricultural implement-makers, *Improvements*

in machinery for washing potatoes and other vegetables. Application dated 18th March; provisional protection, 27th March; notice, 21st July; patent sealed, 11th September, 1863.

2471. John Spencer, of Doncaster, Yorkshire, manufacturer, *Improvements in machinery for separating different sizes of roots.* Application dated 8th October; provisional protection, 23rd October, 1863.

DAIRY UTENSILS, &c.

1082. Margaret Barland, of Mount-street, Grosvenor-square, and E. H. C. Monckton, of the Cavendish Club, *Improvements in apparatus for withdrawing milk from cows and other mammiferæ, and for conducting it when withdrawn to appropriate receivers. (A communication in part from U. S. America.)* Application dated 29th April; provisional protection, 15th May; notice, 8th September; patent sealed, 23rd October, 1863.

1688. W. E. Gedge (Gedge and Son), 11, Wellington-street, Strand, patent agent, *Improved apparatus for milking. (A communication from L. Grasset, of Paris.)* Application dated 7th July; provisional protection, 24th July; notice, 17th November, 1863.

159. John Laurie, of Manchester, agricultural implement-maker, *Improvements in apparatus for churning milk and mixing liquid compounds.* Application dated 19th January; provisional protection, 30th January, 1863.

1660. L. Lelios, of Threadneedle-street, London, *Improvements in apparatus for churning.* Application dated 7th July; provisional protection, 24th July, 1863.

275. John Sainty, of Burnham, Norfolk, agricultural implement-manufacturer, *Improvements in feeding-troughs for sheep and other cattle.* Application dated 29th January; provisional protection, 20th February, 1863.

1876. John Sainty, of Burnham Market, Norfolk, agricultural engineer, *Improvements in the construction of feeding-troughs for sheep and other cattle.* Application dated 29th July; provisional protection, 7th August, 1863.

2011. Edward Taylor, of Salford, Lancashire, machinist, *Improvements in apparatus for churning.* Application dated 14th August; provisional protection, 4th September, 1863.

*2686. Francis Watkins, of Smethwick, Staffordshire, *Improvements in apparatus for milking cows.* Application dated 4th October, 1862; notice, 10th February; patent sealed, 27th March, 1863.

CURING PROCESSES.

2338. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent, *Certain compositions for preserving cheese. (A communication to him from Jean Neuenshwander, of Paris.)* Application dated 22nd September; provisional protection, 9th October, 1863.

*2194. A. and E. M. Denny, of Waterford, Ireland, merchants, *Improvements in the manufacture of bacon.* Application dated 4th August, 1862; patent sealed, 30th January, 1863.

127. Henry Turner, of Leeds, *Invention of a process or mode of preventing and curing blight, decay, &c., in potatoes, &c.* Application dated 15th January; provisional protection, 24th April, 1863.

Seed and Cake Crushers.

456. Jean Joseph Badart, Bishopsgate-street, London, *Improvements in the preparation of cotton-seed cake.* Application dated 19th February; provisional protection, 6th March; patent sealed, 5th May, 1863.

1093. Joseph Badart, 9, Bishopsgate-street, London, for an invention of *Improvements in the preparation of rapeseed-cake, linseed-cake, &c.* Application dated 1st May; provisional protection, 22nd May; notice, 2nd June; patent sealed, 14th July, 1863.

*2927. Francis Gregory, of Manchester, agricultural machinist, *Improvements in presses for pressing seeds, fruits, hops, and other substances.* Application dated 31st October, 1862; notice, 10th March; patent sealed, 24th April, 1863.

2857. James Harrison, of Kingston-upon-Hull, seed-crusher, *Improvements in mills for cleaning cotton-seed.* Application dated 14th November, provisional protection, 11th December, 1863.

1244. Benjamin Hebblewhite, of Kingston-upon-Hull, draper, *Improvements in machinery or mills for crushing or reducing oilcake, seeds, and other substances.* (*A communication from Samuel Hebblewhite, of Sydney, N. S. Wales.*) Application dated 18th May; provisional protection, 5th June, 1863.

Malt-making Machinery.

1539. Joseph Watts, of Coventry, *Improvements in machinery or apparatus for the manufacture of malt.* Application dated 19th June; provisional protection, 17th July; patent sealed, 18th November, 1863.

Stable Fittings, Harness, Appliances for Horse Management, &c.

2091. Henry Balt, of Kentish Town, *Improvements in the roughing of horses by the application of an iron clog, instead of taking off the shoe.* Application dated 20th August; provisional protection, 2nd October; notice, 8th December, 1863.

1685. George Bartholomew, Linlithgow, N. B., edge-tool maker, *Improvements in shoes for the feet of horses and other animals, and in the means of connecting them.* Application dated 7th July; provisional protection, 7th August; notice, 10th November, 1863.

462. Charles Billingsley, of Manchester, saddler, *Improvements in saddlery, harness, driving-straps, and similar articles.* Application dated 23rd February; provisional protection, 6th March; notice, 23rd June; patent sealed, 15th August, 1863.

1375. G. H. Cottam, of the St. Pancras Iron-Works, Old St. Pancras Road, Middlesex, *Improvements in saddle-brackets and in bricks suitable for being used for paving stables and other places.* Application dated 2nd June; provisional protection, 24th July; notice, 28th July; patent sealed, 27th November, 1863.

1852. Abraham English, of Hatfield, Herts, inspector of police, *Improvements in apparatus for securing and protecting horses and other cattle during their transit by rail and other ways, and on board ship.* Application dated 24th July; provisional protection, 7th August; notice, 1st December, 1863.

3041. John Green, of Greenwich, veterinary surgeon, *Improvements in horse-shoes.* Application dated 3rd December; provisional protection, 25th December, 1863.

1807. F. J. Mavor, of Park-street, Middlesex, veterinary surgeon, *Improvements in horse-shoes.* Application dated 11th July; provisional protection, 7th August; notice, 15th September; patent sealed, 16th October, 1863.

1534. S. Middleton, of Newtown Cottage, Hants, near Newbury, Berks, mechanic, *Improvements in iron or other metal shoes, and in the method of securing the same to the hoofs of horses and other animals, without nails.* Application dated 19th June; provisional protection, 10th July, 1863.

730. Frederick Norrington, of Tavistock, Devon, *Improvements in girths or bands and knee-caps for horses.* Application dated 18th March; provisional protection, 27th March; notice, 7th July; patent sealed, 1st September, 1863.

1756. Carl Opperman, of Peckham, Surrey, chronometer manufacturer, *Improvements in means or apparatus to facilitate the connecting and disconnecting horses and other animals with carriages.* Application dated 14th July; provisional protection, 24th July, 1863.

*2692. Robert Page, of Great Yarmouth, Norfolk, builder, *Improvements in stables and stabling, applicable in part to kennels and to the floors of fish-houses.* Application dated 6th October, 1862; patent sealed, 7th March, 1863.

1378. Thomas Page, of Adelphi-terrace, Middlesex, civil engineer, *Improvements in shoeing horses.* Application dated 2nd June; provisional protection, 12th June, 1863.

1600. Thomas Page, of Adelphi-terrace, Middlesex, *Improvements in horse-shoes and their fastenings.* Application dated 25th June; notice, 3rd November; patent sealed, 21st December, 1863.

*2794. H. A. Rémière, of 52, Rue de l'Arbre-sec, Paris, harness-maker, *An improved horse-collar.* Application dated 16th October, 1862; patent sealed, 3rd March, 1863.

419. Hugh Smith, of 3, Regent's Park-terrace, Gloucester Gate, Middlesex, *Improvements in apparatus for feeding horses.* Application dated 16th February; provisional protection, 27th February, 1863.

3061. F. J. Walthew, of Surbiton, Surrey, Esquire, *Improvements in apparatus for sustaining and lifting draught-horses, to prevent them falling or injuring the vehicle to which they are attached.* Application dated 5th December; provisional protection, 25th December, 1863.

621. William Wells, of Ryder's Court, Leicester-square, Middlesex, *Improvements in horse-shoes and in the method of fastening the same.* Application dated 5th March; provisional protection, 20th March, 1863.

Brick and Tile Machines.

*2973. R. A. Brooman, of No. 166, Fleet-street, London, patent agent, *Improvements in machinery for moulding and compressing artificial fuel, peat, bricks, tiles, and other substances. (A communication to him from abroad by Jean Baptiste Defrasne, of Paris.)* Application dated 3rd November, 1862; notice, 10th March; patent sealed, 28th April, 1863.

506. D. B. Chatterton, of Chester, mechanical engineer, *Improved brick-making machinery.* Application dated 24th February; provisional protection, 6th March, 1863.

3199. Henry Clayton, of the Atlas Works, Upper Park-place, Dorset-square, *Improvements in machinery for manufacturing bricks.* Application dated 18th December, 1863.

789. George Cowdery, of Llanymynech, Salop, civil engineer, *Improvements in machinery for making bricks.* Application dated 26th March; provisional protection, 1st May; notice, 16th June; patent sealed, 18th September, 1863.

647. James Cowley, of Oxford, engineer, *Improvements in machinery or apparatus for manufacturing bricks, tiles, pipes, and mouldings.* Application dated 9th March; provisional protection, 3rd April; notice, 7th July; patent sealed, 29th August, 1863.

49. Julius G. Dahlke, of Battersea, Surrey, *Improvements in machinery for cutting clay in the manufacture of bricks, tiles, &c. (A communication from Germany.)* Application dated 6th January; provisional protection, 23rd January; notice, 19th May; patent sealed, 3rd July, 1863.

*3308. Peter Effertz, of Manchester, engineer, *Improvements in machinery or apparatus for making bricks, tiles, drain-pipes, and other similar articles.* Application dated 9th December, 1862; notice, 21st April; patent sealed, 2nd June, 1863.

2335. Peter Effertz, of Manchester, engineer, *Improvements in machinery or apparatus for making bricks, tiles, pipes, and other similar articles.* Application dated 22nd September; provisional protection, 2nd October, 1863.

1692. George Haseltine, 12, Southampton-buildings, Chancery-lane, *Improvements in brick-machines. (A communication from J. Gregg, of Philadelphia, U. S.)* Application dated 8th July; provisional protection, 24th July; notice, 13th October; patent sealed, 20th November, 1863.

*2696. Samuel Holland, of Oldbury, Worcestershire, machinist, *Improvements in machinery for the manufacture of bricks, drain, sanitary, and other pipes, tiles, quarries, and other articles of like manufacture made from clay, marl, and other plastic substances.* Application dated 6th October; provisional protection, 17th October, 1862; notice, 10th February; patent sealed, 27th March, 1863.

2166. Joseph Lewis, of Manchester, engineer, *Certain improvements in machinery or apparatus for preparing and drying clay, and also in machinery to be employed in the manufacture of bricks and tiles.* Application dated 2nd September; provisional protection, 11th September, 1863.

*3166. William Longley, of Leeds, builder, *Improvements in machinery for making bricks.* Application dated 25th November, 1862; notice, 24th February; patent sealed, 7th April, 1863.

*2450. John Platt, of Oldham, and William Richardson, of the same place, engineers, *Improvements in the preparation of clay for the manufacture of bricks, tiles, &c.* Application dated 4th September; provisional protection, 26th December, 1862; notice, 13th January; patent sealed, 27th February, 1863.

*2447. John Platt and William Richardson, of Oldham, Lancashire, mechanical engineers, *Improvements applicable to the burning of bricks, tiles, and other articles of earthenware.* Application dated 4th September, 1862; provisional protection, 26th December; patent sealed, 24th February, 1863.

3145. J. Platt and W. Richardson, of Oldham, Lancashire, mechanical engineers, *Improvements in the preparation of clay for the manufacture of bricks, tiles, and other articles which may be made of such material.* Application dated 12th December, 1863.

*3116. Charles Stevens (Stevens and Henderson), of 31, Charing-Cross, patent agent, *An improved brick-making machine.* (*A communication by Alois Milch, of Paris.*) Application dated 20th November; provisional protection, 28th November, 1862; notice, 31st March; patent sealed, 15th May, 1863.

MANUFACTURE OF PEAT.

597. Theodor Erich, of 77, Newgate-street, London, *Improvements in machinery for pressing peat.* (*A communication from Christian Augustus Erich, of Munich.*) Application dated 3rd March; provisional protection, 20th March, 1863.

2163. Theodor Erich, of Newgate-street, London, *Improvements in machinery for pressing peat.* (*A communication from C. E. Erich, of Munich.*) Application dated 1st September; provisional protection, 18th September, 1863.

528. Thomas Vincent Lee, of 6, Bank-chambers, Lothbury, civil engineer, *Improvements in machinery for digging, compressing, and moulding peat or turf, and for retorts and kilns for drying peat or turf, and making peat or turf charcoal through the agency of hydro-caloric or super-heated steam, and for collecting the products of distillation whilst charring the peat or turf.* Application dated 25th February; provisional protection, 13th March; patent sealed, 10th August, 1863.

WIRE-FENCING, &c.

1311. George Hunt, of Glasgow, patent agent, *Improvements in posts and pillars for fences and gates.* (*A communication from D. Middleton, New Zealand.*) Application dated 25th May; patent sealed, 20th November, 1863.

1720. A. R. Johnston, of Yoxford, Suffolk, gentleman, *Improved portable fence for sheep and cattle pens and other enclosures.* Application dated 10th July; provisional protection, 24th July; notice, 27th October; patent sealed, 29th December, 1863.

1651. John King, of Chadshunt Farm, Kineton, Warwickshire, *Improvements in fencing land and in hanging gates.* Application dated 2nd July; provisional protection, 7th August; notice, 3rd November; patent sealed, 8th December, 1863.

2978. J. A. R. Main, of No. 5, Renfield-street, Glasgow, gentleman, *Improvements in the mode of connecting and sustaining the intersecting bars of iron fences, hurdles, gates, and other analogous structures.* Application dated 27th November, 1863.

1626. Joseph Simpson, of Darlaston, Staffordshire, manufacturer, *Improvements in iron hurdles and fencing.* Application dated 30th June; provisional protection, 10th July, 1863.

HORTICULTURAL APPLIANCES, &c.

1855. T. C. Bull and T. Morgan, of Wolbley, Herefordshire, *An apparatus for collecting fruit from trees without injury.* Application dated 25th July; provisional protection, 14th August, 1863.

3205. F. W. Collins, of Morris, county of Otsego, State of New York, U. S., *A certain improvement in apparatus for training hops.* Application dated 19th December, 1863.

624. John Miller, of Upwey, near Dorchester, Dorset, gentleman, *Improvements in horticultural buildings and other glazed structures, part of which improvements is also applicable to ventilating other buildings.* Application dated 5th March; provisional protection, 20th March; patent sealed, 29th August, 1863.

METHOD OF WARPING LAND, &c.

1762. William Wood, of Monkhill, near Pontefract, Yorkshire, *Improvements in warping or covering land, bog, or peat, with earth or soil.* Application dated 14th July; provisional protection, 24th July; notice, 6th October; patent sealed, 18th November, 1863.

ARTIFICIAL MANURES, TREATMENT OF SEWAGE, &c.

2208. T. H. Baker, of Tunbridge, Kent, engineer, and G. Friend, of the same place, engineer, *Improvements in treating excrementitious and sewage matters, and in the means or apparatus employed therein.* Application dated 8th September; provisional protection, 25th September, 1863.

2849. George Barker, of Pendleton, Lancashire, merchant, *Improvements in the construction of syphons for taking off liquid sewage, overflow of rivers, and other like purposes.* Application dated 14th November; provisional protection, 27th November, 1863.

2731. J. A. Barral, chemist, and L. A. Cochéry, of Paris, *Certain improvements in the manufacture of manure.* Application dated 4th November; provisional protection, 13th November; notice, 8th December, 1863.—French patent dated 29th October; Belgian patent dated 6th November, 1863, *for fixing fertilising elements in phosphate of lime.*

*2712. John and Mary Anne Beale, of Maidstone, *Improvements in the preparation or manufacture of manure.* Application dated 7th October, 1862; notice, 17th February; patent sealed, 6th April, 1863.

1118. Edwin Chesshire, of Birmingham, surgeon, *Improvements in apparatus for intercepting the solid portions of the soil of water-closets.* Application dated, 5th May; provisional protection, 15th May; notice, 25th August; patent sealed, 25th September, 1863.

221. W. Clark, of 53, Chancery-lane, engineer and patent agent, *Improvements in syphons applied to draining, irrigation, and other purposes, whereby they self-suspend and resume action according to requirements.* (*A communication from François Triballat, of* 29, *Boulevart St. Martin, Paris, merchant.*) Application dated 24th January; provisional protection, 13th February, 1863.

761. W. Clark, of 53, Chancery-lane, engineer and patent agent, *Improvements in the separation or obtaining of ammonia from azoted matters in the preparation of manure.* (*A communication to him from abroad, by L. H. Blanchard and Theodore Chateau, of Paris.*) Application dated 21st March; patent sealed, 2nd September, 1863.

1362. W. Clark, 53, Chancery-lane, patent agent, *Improvements in the manufacture of manure.* (*A communication from A. F. Mosselman, of* 29, *Boulevart St. Martin, Paris.*) Application dated 30th May; provisional protection, 12th June; notice, 22nd September; patent sealed, 10th November, 1863.

*2082. Joseph Daniels, of Leigh, Lancashire, *Improvements in artificial manure.* Application dated 22nd July; provisional protection, 1st August; notice, 25th November, 1862; patent sealed, 13th January, 1863.

953. T. Bell Fletcher, M.D., of Birmingham, *Improvements in apparatus for collecting the solid portions of sewage.* Application dated 15th April; notice, 18th August; patent sealed, 2nd October, 1863.

132. John Harrop, of Manchester, analytical chemist, *Improvements in the treatment of organic fecal and urinous matters for the purpose of deodorising the same, and in the preparation of a portable manure therefrom, and in the treatment of ashes or other refuse of combustion to be combined therewith, also for improvements in machinery to be employed in the manufacture of the said manure.* Application dated 15th January; provisional protection, 6th February; notice, 17th March; patent sealed, 10th July, 1863.

321. J. A. Manning, of the Inner Temple, London, *Improvements in the treatment of night-soil and other waste products, and for the manufacture of manure therefrom.* Application dated 4th February; provisional protection, 20th February; patent sealed, 14th July, 1863.

1435. Henry Martin, of Surrey-square, Old Kent-road, land agent, *Improvements in treating and preparing night-soil and sewage with other materials as a manure.* Application dated 9th June; provisional protection, 3rd July, 1863.

3264. John Maynes, of Manchester, engineer, *Improvements in the manufacture of certain descriptions of artificial manure, and in apparatus to be employed therein.* Application dated 24th December, 1863.

606. Thomas Henry Morrell, of Leyland, Lancashire, gentleman, and Joseph Williamson, of Willcross, Gisburn, Yorkshire, gentleman, *Improvements in the purifying of the noxious vapours or gases given off from night-soil or other similar substances during the heating, drying, or evaporating of such substances.* Application dated 4th March; provisional protection, 20th March; notice, 24th March; patent sealed, 29th August, 1863.

*3361. J. L. W. Thudichum, M.D., of Kensington, Middlesex, *Improvements in collecting human excreta, and in the apparatus and means employed therein.* Application dated 16th December; provisional protection, 26th December, 1862; notice, 28th April, 1863.

2724. Guillaume Ville, of Paris, Professor at the Museum of Natural History, *Improvements in treating natural phosphates of lime for agricultural purposes.* Application dated 4th November; provisional protection, 20th November, 1863.

*3132. Thomas Walker, of Birmingham, engineer, *Improvements in utilizing sewage matters, and in the means or apparatus employed therein, part of which improvements is also applicable to raising and forcing other fluids.* Application dated 21st November, 1862; notice, 17th March, 1863.

3152. John Wright, of Marple, near Stockport, Cheshire, *Improvements in the manufacture of superphosphate of lime.* Application dated 14th December, 1863.

CONDIMENTAL FOOD.

2050. Alexander Cruickshank, of Glen Park, Lanarkshire, N. B., gentleman *Improvements in the manufacture or production of food for cattle an*

all other domestic animals, poultry, and game. Application dated 18th August; notice, 10th November; patent sealed, 29th December, 1863.

1279. John Fawcett, of Huddersfield, Yorkshire, cattle-food manufacturer, *Improvements in the preparation of food for cattle, horses, and other animals.* Application dated 21st May; provisional protection, 5th June; notice, 6th October; patent sealed, 18th November, 1863.

3174. John Sellars, of Manchester, manufacturing chemist, *An improved preparation of food for cattle.* Application dated 16th December, 1863.

*3273. George Wright, of Friern Manor, Peckham Rye, Surrey, *Improvements in the preparation and manufacture of food for cattle.* Application dated 6th December, 1862; notice, 21st April; patent sealed, 2nd June, 1863.

MISCELLANEOUS.

363. Robert Burley, of Glasgow, *Improvements in handles for hammers, mallets, picks, mattocks, and similar tools.* Application dated 10th February; provisional protection, 20th February; patent sealed, 4th August, 1863.

767. William Clark, of 53, Chancery-lane, Middlesex, engineer, *Improvements in agricultural apparatus. (A communication from abroad by J. B. Décours, A. C. Le Levandier, and P. E. Lambert, of Paris.)* Application dated 23rd March; provisional protection, 10th April; notice, 30th June; patent sealed, 11th September, 1863.

*2106. J. G. Clarke, of Brackley, Northamptonshire, *Improvements in scythes.* Application dated 24th July; provisional protection, 1st August; notice, 2nd December, 1862; patent sealed, 21st January, 1863.

476. R. V. Dodwell, of Manchester, district engineer to the Magnetic Telegraph Company, *An improved method of preventing the destruction of plants by insects and certain descriptions of animals, and in the means for effecting the same.* Application dated 21st February; provisional protection, 6th March, 1863.

716. W. E. Newton, of 66, Chancery-lane, Middlesex, civil engineer, *An improved preparation for the cure of scab, foot-rot, and other diseases of sheep and cattle. (A communication from abroad by Patrick Hayes, of Melbourne, in the colony of Victoria, chemical manufacturer.)* Application dated 17th March; provisional protection, 10th April; notice, 14th April; patent sealed, 19th May, 1863.

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Consulting-Chemist—Dr. Augustus Voelcker, 101, *Leadenhall Street,* **E.C.**
Veterinary-Inspector—James Beart Simonds, *Royal Veterinary College,* **N.W.**
Consulting Engineer—James Easton, or C. E. Amos, *Grove, Southwark,* **S.E.**
Seedsmen—Thomas Gibbs and Co., *Corner of Halfmoon Street, Piccadilly,* **W.**
Publisher—John Murray, 50, *Albemarle Street,* **W.**
Bankers—The London and Westminster Bank, *St. James's Square Branch,* **S.W.**

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BRAMSTON, T. W., M.P.
HOBBS, WM. FISHER.
TORR, WILLIAM.

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BRAMSTON, T. W., M.P.
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GIBBS, B. T. BRANDRETH.
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SPEAKER, The Rt. Hon. THE.
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ARKWRIGHT, J. H.
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HOBBS, WM. FISHER.
HOLLAND, ED., M.P.
[illegible], JOHN.
JONAS, SAMUEL.
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PAIN, THOMAS.
POPE, EDWARD.
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HOSKYNS, C. WREN.
KINGSCOTE, Col., M.P.
LAYCOCK, JOSEPH.
MILWARD, RICHARD.
NEWCASTLE, Mayor of.
PAIN, THOMAS.
POPE, EDWARD.
RAMSAY, G. H.
RANDELL, CHARLES.
SHUTTLEWORTH, JOSEPH.
THOMPSON, H. S., M.P.
TORR, WILLIAM.
WILSON, JACOB.

*** The PRESIDENT, TRUSTEES, and VICE-PRESIDENTS are Members *ex officio* Committees.

MEMORANDA.

ADDRESS OF LETTERS.—The Society's office being situated in the postal district designated by the letter W, members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

GENERAL MEETING in London, May 23, 1864, at Twelve o'clock.

MEETING at Newcastle-upon-Tyne, commencing July 18, 1864.

GENERAL MEETING in London, in December, 1864.

MONTHLY COUNCIL (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

WEEKLY COUNCIL (for practical communications), at 12 o'clock on all Wednesdays in February, March, April, May, June, July, and November, excepting the first Wednesday in each of those months, and during adjournment: open to all Members of the Society, who are particularly invited by the Council to avail themselves of this privilege.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

DISEASES of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society; and of sending animals to the Royal Veterinary College, on the same terms as if they were subscribers to the College.—(A statement of these privileges will be found in the present Appendix.)

CHEMICAL ANALYSIS.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in the Appendix of the present volume.

LOCAL CHEQUES.—Members are particularly requested not to forward Country Cheques for payment in London; but London Cheques, or Post-office Orders on Vere-street (payable to H. HALL DARE), in lieu of them. All Cheques are required to bear upon them a penny draft or receipt stamp, which must be cancelled in each case by the initials of the drawer. They may also conveniently transmit their Subscriptions to the Society, by requesting their Country Bankers to pay (through their London Agents) the amount at the Society's Office (No. 12, Hanover Square, London), between the hours of ten and four, when official receipts, signed by the Secretary, will be given for such payments.

NEW MEMBERS.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary.

PACKETS BY POST.—Packets not exceeding two feet in length, width, or depth, consisting of written or printed matter (but not containing letters sealed or open), if sent without envelopes, or enclosed in envelopes open at each end, may be forwarded by the inland post, if stamped, at the following rates:—

For a packet not exceeding	4 ounces	(or quarter of a pound) . . .	1 penny
„ „ „	8 „	(or half a pound)	2 pence.
„ „ „	16 „	(or one pound)	4 „
„ „ „	24 „	(or one pound and a half) . .	6 „
„ „ „	32 „	(or two pounds)	8 „

[And so on in the proportion of 8 ounces for each additional 2d.]

*** Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-Laws, of a Statement of the General Objects, &c., of the Society, of Chemical and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Wednesday, December 9, 1863.

REPORT OF THE COUNCIL.

The Council have to report that since the last General Meeting 317 members have been elected, while 2 Governors and 33 members have died, and 22 members have been removed from the list; so that the Society now consists of—

79 Life Governors,
87 Annual Governors,
1,308 Life Members,
3,952 Annual Members,
17 Honorary Members,

making a total of 5,443 at the present time; being an increase of 266 within the year.

The finances of the Society are in a satisfactory condition, as is shown by the Balance-sheet to the 30th of June, which has been already published in the 'Journal;' since which time the Finance Committee have reported that all claims against the Society submitted to them up to their last meeting had been discharged. The funded property invested in the names of the Trustees remains at 16,488*l.* 17*s.* 10*d.* stock in the New Three per Cents.

The collection of the arrears of subscription has been steadily progressing; the amount now due, inclusive of those in arrear for the present year, being 631*l.*; and the Council hope that, by an early payment of the subscription, the members will enable them to frame the financial arrangements for the ensuing year.

The period of holding the half-yearly audits having been more closely approximated to the termination of the half-years,

the Council are thus enabled to inform the members, in each successive 'Journal,' as to the latest state of the Society's accounts.

The Worcester Meeting, notwithstanding the unfavourable weather on some days of the Show, fully satisfied the expectations of the Council. The authorities of the city and the Local Committee contributed greatly to promote the objects of the Society on the occasion, and received at the time the public thanks of the members at the General Meeting held in the Town Hall.

The Balance-sheet of the Meeting, which is now laid before the members and will be published in the February 'Journal,' shows that the system of distributing the forage by means of tickets furnished to exhibitors has proved satisfactory, and has tended to reduce this item of expense in the Live Stock Department.

The quadrennial system for the trial of implements, which commenced at Warwick, has terminated this year at Worcester, and, at the request of the Council, the Implement Committee have given the subject their careful consideration. The Council have adopted the recommendation of the Committee, that the trials should, as formerly, be triennial; such special prizes and medals for miscellaneous improvements being also offered each year as the Council may determine. The following is the schedule of arrangement:—

SPECIAL PRIZE FOR STEAM-CULTIVATION.

1864.—I. IMPLEMENTS AND MACHINERY FOR THE DRAINAGE, TILLAGE, AND CULTIVATION OF LAND.—Tile and brick machines, draining implements, grubbers, ploughs, cultivators, clod-crushers, rollers, harrows.

1865.—II. IMPLEMENTS AND MACHINERY FOR THE CULTIVATION AND HARVESTING OF CROPS.—Drills and distributors, horse-hoes, mowing-machines, reaping-machines, haymaking-machines, horse-rakes, carts and waggons.

1866.—III.—IMPLEMENTS AND MACHINERY FOR THE PREPARATION OF CROPS FOR MARKET AND FOR FEEDING STOCK.—Steam-engines, thrashing-machines, dressing-machines, mills and crushers, chaff-cutters, cake-breakers, root-cutters and pulpers, dairy implements.

In order to consider the most effectual means of obviating the practice of unfairly clipping sheep for exhibition at the Society's country meetings, the Council appointed a Committee to take

this subject into consideration, and have approved of the following regulations, which they trust will effectually prevent the recurrence of an evil so generally complained of:—

1. That sheep exhibited for any of the prizes must have been *really and fairly shorn bare* after the 1st of April in the year of the exhibition; and that the date of such shearing form part of the certificate of entry.
2. That two inspectors be appointed by the Council, to examine the sheep on their admission to the show-yard, with instructions to report to the Stewards any cases in which the sheep have not been *really and fairly shorn bare*.

The country meeting next year will be held in the week commencing Monday the 18th July, and the authorities at Newcastle-upon-Tyne are making great exertions to place the land for the show-yard and trial-fields in a course of due preparation.

The Council have decided on the prize-sheet for the Newcastle Meeting. That for live stock will amount to 2820*l.*, being an increase over last year of 625*l.*; and for implements the amount will be 550*l.*, being an increase over last year of 240*l.*, making a total increase of 865*l.*

The above will, in addition to the usual prizes, include classes for Channel Islands, Ayrshire, Scotch Horned, and Polled Cattle, Clydesdale Horses, Cheviots, and Black-faced Mountain Sheep.

By Order of the Council,

H. Hall Dare,
Secretary.

COUNTRY MEETING ACCOUNT, WORCESTER, 1863.

Receipts.

	£.	s.	d.
Subscription from Worcester	1800	0	0
Admissions to Show Yard	5,485	10	9
Sale of Catalogues	509	10	0
Implement Exhibitors' Payment for Shedding	1,035	19	0
Non-Members' Fees for entry of Implements	49	5	0
Fees for entry of Live-Stock	408	10	0
Fees for Horse Boxes	318	0	0
Fees for Nurse Cows	19	0	0
Fines for non-Exhibition of Live-Stock	31	0	0
Extra lines in Implement Catalogue	25	18	0
Sale of Wheat, Barley, &c.	149	4	0
Sale of Sundries	14	8	0
Excess of Payments over Receipts	1,243	15	5

Expenditure.

	£.	s.	d.
Show and Trial Yards, Horse Boxes, hire of Hurdles and Turnstiles	[illegible]		
*Repairs to Engineering Plant, and Carriage, &c.	[illegible]		
Judges: Implements, 212*l.*; Stock, 310*l.*	[illegible]		
Consulting-Engineer's Assistants	[illegible]		
Veterinary-Inspectors and Assistant	[illegible]		
Metropolitan Police	[illegible]		
Clerks and Assistants: Secretary, 60*l.*; Hon. Director, 35*l.* 11*s.* 8*d.*; Bankers, 21*l.*	[illegible]		
Assistant Stewards: Implements, 31*l.* 10*s.*; Stock, 25*l.* 4*s.*; Forage, 27*l.* 1*s.*	[illegible]		
Foremen of [illegible]	[illegible]		
Yardmen [illegible]; Fieldmen, 13*l.* 7*s.* 6*d.*; Foragemen, 7*l.* 4*s.*	[illegible]		
Waggon[illegible]; Gro[illegible], 11*l.* 17*s.* 6*d.*	[illegible]		
Index-C[illegible]ney-takers, 71*l.* 8*s.*; Door-keepers, Money-changer, &c., 28*l.* 7[illegible]	[illegible]	[illegible]	[illegible]
Lodgings for Stewards, Implement Judges, Veterinary Inspectors, Engineers, &c.	[illegible]	4	0
Refreshments for ditto	[illegible]	13	0
Catalogues—Implements, 345*l.* 10*s.*; Stock, 109*l.* 10*s.*; Awards: Implements, 5*l.* 17*s.*; Stock, 70*l.* 14*s.*; Sellers of, 27*l.* 6*s.*; Packing-cases, 18*l.* 10*s.*	577	7	0
Printing—Prize-sheets, Certificates, Admission-Orders, Tickets, Railway Papers, Parchment Labels, Circulars, Programmes, Notices, &c.	256	17	6
Advertising—Newspapers, 208*l.* 17*s.* 6*d.*; Railways and Bill Posting, 57*l.* 12*s.*	266	9	6
Postage and Carriage, 71*l.* 12*s.* 3*d.*; Stationery, 13*l.* 5*s.* 7*d.*	84	17	10
Wheat and Barley, 290*l.*; Insurance of, 10*s.*	290	10	0
Hay, 135*l.* 2*s.* 6*d.*; Straw, 189*l.* 8*s.* 8*d.*; Vetches, 204*l.* 1*s.* 6*d.*; Oats, 11*l.* 5*s.* 3*d.*	539	17	11
Bankers—Commission, 15*l.*; Cab Hire, &c., 7*l.* 1*s.* 6*d.*; Base Coin, 2*l.* 2*s.* 4*d.*	24	3	10
Surveying	26	3	6
Hire of Fire Engines, 9*l.* 9*s.*; Hire of Steam Engines, 7*l.*; use of Driving Belt, 1*l.* 10*s.*	17	19	0
Coals, 19*l.* 1*s.* 2*d.*; Corn and Coal Sacks, 26*l.* 10*s.*; Bags and Twine, 3*l.* 16*s.* 7*d.*	49	[illegible]	9
Badges	[illegible]	[illegible]	6
Official Staff—Board, Lodgings, and Travelling Expenses	[illegible]	[illegible]	6
Sundry Small Bills and Petty Payments	[illegible]	[illegible]	11
Prizes—Implements, 280*l.*; Stock, 2180*l.*; Medals, 77*l.* 2*s.*	[illegible]	[illegible]	0

Dr. **Half-yearly Cash Account**

	£.	s.	d.	£.	s.	d.	£.	s.	d.
To Balance in hand, 1st July, 1863:—									
Bankers				2,585	1	11			
Secretary				1	8	9			
							2,586	10	8
To Deposit withdrawn from the London and Westminster Bank				..	..		2,000	0	0
To Income, viz.:—									
Dividends on Stock				240	2	5			
Subscriptions:—									
Governors' Annual	30	0	0						
Members' Life-Compositions ..	500	0	0						
Members' Annual	690	1	0						
				1,220	1	0			
Journal:—									
Sales	84	9	10						
Advertisements	38	18	0						
				123	7	10			
Interest on Deposit				19	16	7			
							1,603	7	10
To Worcester Meeting				..	..		6,190	3	3
							£12,380	1	9

Balance-Sheet,

LIABILITIES.	£.	s.	d.	£.	s.	d.
To Capital:—						
Surplus, 30th June, 1863	..	..		20,230	15	1
Less Surplus of Expenditure over Income during the Half-year to 31st December, 1863, viz:—						
Expenditure	2,314	10	10			
Income	1,603	7	10			
	711	3	0			
To Worcester Meeting:—						
Amount at debit of this Account	1,176	15	1			
				1,887	18	1
				£18,342	17	0

(Signed) A. N. HOOD, *Chairman of Finance Committee.*
QUILTER, BALL, & Co., *Accountants.*

FROM 1ST JULY TO 31ST DECEMBER, 1863. CR.

	£. s. d.	£. s. d.	£. s. d.
By Expenditure:—			
Establishment—			
Official Salaries and Wages ..	327 6 0		
House Expenses, Rent, Taxes, &c.	376 8 8		
		703 14 8	
Journal:–			
Printing	602 18 0		
Stitching	72 7 9		
Delivery, Advertising, &c... ..	163 15 0		
Prize Essays	50 0 0		
Other Contributions	89 15 0		
Editor's Salary	250 0 0		
		1,228 15 9	
Chemical:—			
Consulting Chemist's Salary		150 0 0	
Veterinary:—			
Grant to Royal Veterinary College		100 0 0	
Postage and Carriage		14 2 4	
Advertisements		13 13 6	
Sundries		20 4 7	
Subscription returned (paid in error)		1 0 0	
Dynamometer and Testing Apparatus..		73 0 0	
London Show		10 0 0	
			2,314 10 10
By Worcester Meeting		.. ..	9,604 5 0
Total Payments		.. ..	11,918 15 10
By Balance in hand:—			
Bankers		443 12 6	
Secretary		17 13 5	
			461 5 11
			£12,380 1 9

31ST DECEMBER, 1863.

ASSETS.	£. s. d.
By Cash in hand	461 5 11
By New 3 per cent. Stock 16,488*l.* 17*s.* 10*d.* cost	15,881 11 1
By Books and Furniture, Society's House, Hanover Square	2,000 0 0
Mem.—The above Assets are exclusive of the amount recoverable in respect of Subscriptions in arrear 31st December, 1863, which at that date amounted to 574*l.*	
	£18,342 17 0

Examined, audited, and found correct, this 10th day of February, 1864.

(Signed) W. COPELAND ASTBURY.
HENRY CORBET.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Dr. YEARLY CASH ACCOUNT, FROM 1ST JANUARY TO 31ST DECEMBER, 1863. **Cr.**

	£. s. d.	£. s. d.	£. s. d.
To Balance in hand, 1st Jan. 1863:—			
Bankers	. .	319 2 8	
Secretary	. .	33 3 9	
			382 6 5
To Deposit withdrawn from the London and Westminster Bank	. .	. .	2,000 0 0
To Income, viz.:—			
Dividend on Stock	. .	478 3 7	
Subscriptions:—			
Governors' Annual	420 0 0		
Members' Life-Compositions	950 0 0		
Members' Annual	3,684 6 0		
		5,054 6 0	
Journal:—			
Sales	201 9 4		
Advertisements	62 14 4		
		264 3 8	
Veterinary:—Sale of Pamphlets	. .	5 1 3	
Sale of Wool	. .	6 3 0	
Interest on Deposit	. .	19 16 7	
			5,827 14 1
To Country Meetings:—			
London Show	. .	2 6 0	
Worcester Meeting	. .	9,808 3 3	
			9,810 9 3
			£ 18,020 9 9

	£. s. d.	£. s. d.	£. s. d.
By Expenditure:—			
Establishment—			
Official Salaries and Wages	654 12 0		
House Expenses, Rent, Taxes, &c.	634 3 10		
		1,288 15 10	
Journal:—			
Printing	988 19 0		
Stitching	137 7 9		
Delivery, Advertising, &c.	273 13 3		
Prize Essays	75 0 0		
Literary Contributions	95 5 0		
Editor's Salary	500 0 0		
		2,070 5 0	
Chemical:—			
Consulting Chemist's Salary	300 0 0		
Grant for Investigations	200 0 0		
		500 0 0	
Veterinary:—			
Grant to Royal Veterinary College	. .	200 0 0	
Stock Brokerage	. .	9 13 6	
Postage and Carriage	. .	58 0 4	
Advertisements	. .	26 17 0	
Sundries	. .	31 1 5	
Subscriptions returned (paid in error)	. .	4 0 0	
Dynamometer and Testing Apparatus	. .	73 0 0	
Wool at International Exhibition	. .	9 16 4	
			4,271 9 5
By Country Meetings—			
London Show	. .	592 16 1	
Worcester Meeting	. .	10,694 18 4	
			11,287 14 5
Total Payments	. .	. .	15,559 3 10
By Deposit with London and Westminster Bank	. .	. .	2,000 0 0
By Balance in hand, 31st Dec., 1863:—			
Bankers	. .	443 12 6	
Secretary	. .	17 13 5	
			461 5 11
			£ 18,020 9 9

Newcastle-upon-Tyne Meeting, 1864:

IN THE WEEK COMMENCING MONDAY, JULY 18.

SCHEDULE OF PRIZES.

I.—Live-Stock Prizes offered by the Society.

(All Ages calculated to July 1st, 1864).

Reference Number in Certificates.	CATTLE,	First Prize.	Second Prize.
	Short-Horned.		
Class.		£.	£.
1	Bull, above three and not exceeding six years old	25	15
2	Bull, above two and not exceeding three years old	25	15
3	Bull, above one and not exceeding two years old	25	15
4	Bull-Calf, above six and not exceeding twelve months old	10	5
5	Cow, above three years old	20	10
6	Heifer, in-milk or in-calf, not exceeding three years old	15	10
7	Yearling Heifer	15	10
8	Heifer-Calf, above six and under twelve months old	10	5
	Hereford.		
9	Bull, above three and not exceeding six years old	25	15
10	Bull, above two and not exceeding three years old	25	15
11	Bull, above one and not exceeding two years old	25	15
12	Bull-Calf, above six and not exceeding twelve months old	10	5
13	Cow, above three years old	20	10
14	Heifer, in-milk or in-calf, not exceeding three years old	15	10
15	Yearling Heifer	15	10
16	Heifer-Calf, above six and under twelve months old	10	5
	Devon.		
17	Bull, above three and not exceeding six years old	25	15
18	Bull, above two and not exceeding three years old	25	15
19	Bull, above one and not exceeding two years old	25	15
20	Bull-Calf, above six and not exceeding twelve months old	10	5
21	Cow, above three years old	20	10
22	Heifer, in-milk or in-calf, not exceeding three years old	15	10
23	Yearling Heifer	15	10
24	Heifer-Calf, above six and under twelve months old	10	5

Reference Number in Certificates.	CATTLE—*continued.*	First Prize.	Se P
	SUSSEX.		
Class.		£.	
25	Bull, above one and not exceeding six years old ..	10	
26	Cow, above three years old	10	
27	Heifer, in-milk or in-calf, not exceeding three years old	10	
28	Yearling Heifer	10	
	CHANNEL ISLANDS.		
29	Bull, above one and not exceeding six years old ..	10	
30	Cow, above three years old	10	
31	Heifer, in-milk or in-calf not exceeding three years old	10	
	AYRSHIRE.		
32	Bull, calved before the 1st of January, 1863 ..	20	1
33	Bull, calved after the 1st of January, 1863	20	1
34	Cow, above three years old	15	
35	Heifer, calved before the 1st of January, 1863 ..	10	
36	Heifer, calved after the 1st of January, 1863 ..	10	
	SCOTCH POLLED (except Galloways).		
37	Bull, calved before the 1st of January, 1863 ..	20	1
38	Bull, calved after the 1st of January, 1863 ..	20	1
39	Cow, above three years old	15	
40	Heifer, calved before the 1st of January, 1863 ..	10	
41	Heifer calved after the 1st of January, 1863 ..	10	
	SCOTCH HORNED.		
42	Bull, calved before the 1st of January, 1863 ..	20	1
43	Bull, calved after the 1st of January, 1863 ..	20	1
44	Cow, above three years old	15	
45	Heifer, calved before the 1st of January, 1863 ..	10	
46	Heifer, calved after the 1st of January, 1863 ..	10	
	OTHER ESTABLISHED BREEDS.		
	Not including the Short-horn, Hereford, Devon, Sussex, Channel Islands, Ayrshire, Scotch Horned, or Polled Breeds.		
47	Bull, above two and not exceeding six years old	10	
48	Bull, above one and not exceeding two years old	10	
49	Cow, above three years old	10	
50	Heifer, in-milk or in-calf, not exceeding three years old	10	
51	Yearling Heifer	10	

Reference Number in Certificates.	HORSES.	First Prize.	Second Prize.
Class.		£.	£.
52	For the THOROUGH-BRED STUD-HORSE, having served Mares during the season 1864, which, in the opinion of the Judges, is best calculated to *improve* and *perpetuate* the breed of the sound and stout Thorough-Bred Horse for General Stud Purposes	100	25
	HUNTER.		
53	Stallion, Thorough-Bred, suitable for getting Hunters, whose regular charge for serving half-bred Mares during the season 1864 has not exceeded Five Guineas	25	15
54	Brood Mare, with foal at foot, or in-foal, for breeding Hunters	15	10
	HACKNEY.		
55	Brood Mare, with foal at foot, or in-foal, for breeding Hackneys	15	10
	PONIES.		
56	Stallion, not exceeding 14 hands	15	5
57	Mare, not exceeding 14 hands	10	5
	AGRICULTURAL AND DRAY HORSES.		
	AGRICULTURAL.		
	Not qualified to compete as Suffolk or Clydesdale.		
58	Stallion, foaled before the 1st of January, 1862 ..	20	10
59	Stallion, foaled in the year 1862	15	10
60	Mare and Foal	20	10
61	Two years old Filly	15	10
	DRAY.		
62	Stallion, foaled before the 1st of January, 1862 ..	20	10
63	Stallion, foaled in the year 1862	15	10
64	Mare and foal	20	10
65	Two years old Filly	15	10

Reference Number in Certificates.	HORSES—*continued.*	First Prize.	Second Prize.
	SUFFOLK.		
Class.		£.	£.
66	Stallion, foaled before the 1st of January, 1862 ..	20	10
67	Stallion, foaled in the year 1862	15	10
68	Mare and Foal	20	10
69	Two years old Filly	15	10
	CLYDESDALE.		
70	Stallion, foaled before the 1st of January, 1862 ..	20	10
71	Stallion, foaled in the year 1862	15	10
72	Mare and Foal	20	10
73	Two years old Filly	15	10
	SHEEP.		
	LEICESTER.		
74	Shearling Ram	20	10
75	Ram of any other age	20	10
76	Pen of Five Shearling Ewes, of the same flock ..	15	10
	COTSWOLD.		
77	Shearling Ram	20	10
78	Ram of any other age	20	10
79	Pen of Five Shearling Ewes, of the same flock ..	15	10
	LINCOLN AND OTHER LONG-WOOLLED. *Not qualified to compete as Leicesters or Cotswolds.*		
80	Shearling Ram	20	10
81	Ram of any other age	20	10
82	Pen of Five Shearling Ewes, of the same flock ..	15	10
	OXFORDSHIRE DOWN.		
83	Shearling Ram	20	10
84	Ram of any other age	20	10
85	Pen of Five Shearling Ewes, of the same flock ..	15	10
	SOUTHDOWN.		
86	Shearling Ram	20	10
87	Ram of any other age	20	10
88	Pen of Five Shearling Ewes, of the same flock ..	15	10

Reference Number in Certificates.	SHEEP—*continued.*	First Prize.	Second Prize.
Class.	SHROPSHIRE.	£.	£.
89	Shearling Ram	20	10
90	Ram of any other age	20	10
91	Pen of Five Shearling Ewes, of the same flock ..	15	10
	HAMPSHIRE AND OTHER SHORT-WOOLLED. *Not qualified to compete as Southdowns or Shropshires.*		
92	Shearling Ram	20	10
93	Ram of any other age	20	10
94	Pen of Five Shearling Ewes, of the same flock ..	15	10
	MOUNTAIN.—CHEVIOTS.		
95	Shearling Ram	15	5
96	Ram of any other age	15	5
97	Pen of Five Shearling Ewes, of the same flock ..	10	5
	BLACKFACED.		
98	Shearling Ram	15	5
99	Ram of any other age	15	5
100	Pen of Five Shearling Ewes, of the same flock ..	10	5
	PIGS.		
101	Boar of a large white breed	10	5
102	Boar of a small white breed	10	5
103	Boar of a small black breed	10	5
104	Boar of the Berkshire breed	10	5
105	Boar of a breed not eligible for the preceding classes	10	5
106	Breeding Sow of a large white breed	10	5
107	Breeding Sow of a small white breed	10	5
108	Breeding Sow of a small black breed	10	5
109	Breeding Sow of the Berkshire breed	10	5
110	Breeding Sow of a breed not eligible for the preceding classes	10	5
111	Pen of three Breeding Sow-Pigs of a large white breed, of the same litter, above four and under	10	5
	eight months old	10	5
112	Pen of three Breeding Sow-Pigs of a small white breed, of the same litter, above four and under eight months old	10	5

Reference Number in Certificates.	·PIGS—*continued.*	First Prize.	Second Prize.
Class.		£.	£.
113	Pen of three Breeding Sow-Pigs of a small black breed, of the same litter, above four and under eight months old	10	5
114	Pen of three Breeding Sow-Pigs of the Berkshire breed, of the same litter, above four and under eight months old	10	5
115	Pen of three Breeding Sow-Pigs of a breed not eligible for the preceding classes, of the same litter, above four and under eight months old ..	10	5
	If Ten Animals or Pens be Exhibited in any Class, a Silver Medal may be awarded to the Third best.		

II.—Implement and Machinery Prizes offered by the Society.

I. Steam Cultivation.

			£.
The best application of Steam Power for the cultivation of the soil		First prize	100
Ditto	ditto	ditto Second prize	50
The best application of Steam Power adapted for small occupations		First prize	50
Ditto	ditto	ditto Second prize	25
For the Class of	Ploughs for Steam Power		30
Ditto	Cultivators		30
Ditto	Harrows		20
Ditto	Windlasses, and application of power thereto		30
Ditto	Anchors		20
Ditto	Rope Porters		15

II. Drainage.

For the Class of Tile and Brick Machines 20
For the best Set of Draining Tools .. .. Silver medal

III. Ploughs.

For the Class of	Wheel Ploughs	30
Ditto	Swing Ploughs	30
Ditto	Subsoil Ploughs	10
Ditto	Paring Ploughs	10

IV. Cultivators.

For the Class of Cultivators 30

V. Clodcrushers.

	£.
For the Class of Clodcrushers	20

VI. Rollers.

For the Class of Rollers	10

VII. Harrows.

For the Class of Harrows	20

VIII. Miscellaneous.

Awards to Agricultural articles, and essential improvements therein (10 silver medals).

III.—Special Prizes offered by the Local Committee of Newcastle-upon-Tyne.

Reference Number in Certificates.	CATTLE.	First Prize.	Second Prize.
Class.	Galloway.	£.	£.
116	Bull, calved previous to the 1st of January, 1863	20	10
117	Bull, calved after the 1st of January, 1863	20	10
118	Cow, above three years old	15	5
119	Heifer, calved previous to the 1st of January, 1863	10	5
120	Heifer, calved after the 1st of January, 1863 ..	10	5
	SHEEP.		
	Border Leicester.		
121	Shearling Ram	15	5
122	Ram of any other age	15	5
123	Pen of Five Shearling Ewes, of the same flock ..	10	5
124	Pen of Five Ewes, of any other age, of the same flock	10	5
	Ewes exhibited in this Class must have reared Lambs during the Spring of 1864.		
	Herdwick.		
125	Shearling Ram	15	5
126	Ram of any other age	15	5
127	Pen of Five Shearling Ewes, of the same flock ..	10	5

Reference Number in Certificates.	HORSES.	First Prize.	Se P
Class.		£.	
128	Hunter—Mare or Gelding, five or six years old ..	20	
129	Hunter—Mare or Gelding, four years old	20	
130	Hunter—Colt or Filly, three years old	10	
131	Roadster—Stallion	15	
132	Roadster—Mare or Gelding, above four years and not exceeding twelve years old; and also not exceeding 15 hands	10	
133	Pony—Gelding, of any age, not exceeding 14 hands	5	
134	Mountain Mare Pony, of any age, not exceeding 13½ hands, with foal at foot, or stinted	10	
135	Pair of Mares or Geldings, or Mare and Gelding, for agricultural purposes	10	
136	Gelding or Filly, three years old, for agricultural purposes	10	
137	Gelding, two years old, for agricultural purposes ..	5	
138	Gelding or Filly, one year old, for agricultural purposes	10	
	WOOL.		
	(Five Fleeces each).		
139	Leicester	2	
140	Cotswold	2	
141	Lincoln and other Long-woolled	2	
142	Oxfordshire Down	2	
143	Southdown	2	
144	Shropshire	2	
145	Hampshire and other Short-woolled	2	
146	Cheviot	2	
147	Blackfaced	2	
148	Herdwick	2	
	BUTTER.		
149	Firkin Butter (one firkin each)	5	
150	Fresh Butter (6 lbs., in single pounds)	5	

CONDITIONS RELATING TO LIVE-STOCK.

1. No bull above two years old will be eligible for a prize unless certified to have served not less than three different cows (or heifers) within the three months preceding the 1st of June in the year of the Show.

2. No cow will be eligible for a prize unless certified to have had a live calf, either between the date of entry and that of the Show, or within the twelve months preceding the date of the Show.

3. No heifer, except yearlings, entered as in-calf, will be eligible for a prize unless she is certified to have been bulled before the 31st of March in the year of Show, nor will her owner afterwards receive the prize until he shall have furnished the Secretary with a further certificate that she produced a live calf before the 31st of January in the subsequent year.

4. All foals must be the offspring of the mare along with which they are exhibited for the prize.

5. The ewes in each pen must be of the same flock.

6. Sheep exhibited for any of the prizes (except blackfaced mountain and Herdwick sheep, which may be shown in the wool) must have been *really and fairly shorn bare* after the 1st of April in the year of the Exhibition; and the date of such shearing must form part of the Certificate of Entry. Two Inspectors will be appointed by the Council to examine the sheep on their admission to the Show-Yard, with instructions to report to the Stewards any cases in which the sheep have not been *really and fairly shorn bare.*

7. The three sow-pigs in each pen must be of the same litter.

8. The breeding sows in Classes 106, 107, 108, 109, and 110, shall be certified to have had a litter of live pigs within the six months preceding the Show, or to be in-pig at the time of entry, so as to produce a litter before the 1st of September following. In the case of in-pig sows, the prize will be withheld until the Exhibitor shall have furnished the Secretary with a certificate of farrowing, as above.

9. No sow, if above eighteen months old, that has not produced a litter of live pigs, shall be eligible to compete in any of the classes.

10. The Judges of pigs will be instructed, with the sanction of the Stewards, to withhold prizes from any animals which shall appear to them to have been entered in a wrong class; and to affix a placard of disqualification to the pens of those animals.

11. All pigs exhibited at the country meetings of the Society shall be subjected to an examination of their mouths by the Veterinary Inspector of the Society; and should the state of dentition in any pig indicate that the age of the animal has not been correctly returned in the Certificate of Entry, the Stewards shall have power to disqualify such pig, and shall report the circumstance to the Council at its ensuing monthly meeting.

12. If a litter of pigs be sent with a breeding sow, the young pigs must be the produce of the sow, and must not exceed three months old.

13. No horse shall be exhibited without a certificate from a Member of the Royal College of Veterinary Surgeons, as to the state of the animal with reference to hereditary diseases, particularly those of the respiratory and visual

organs; which certificate shall accompany the Certificate of Entry; but that the above shall not supersede the usual examination by the Society's Veterinary Inspector.

14. A form of certificate will be sent to every Exhibitor of horses, to be filled up by a Member of the Royal College of Veterinary Surgeons, certifying to the soundness of every horse exhibited, without which such horse shall not be admitted into the Yard.

RULES OF ADJUDICATION.

1. As the object of the Society in giving prizes for neat cattle, sheep, and pigs, is to promote improvement in *breeding* stock, the Judges in making their awards will be instructed not to take into their consideration the present value to the butcher of animals exhibited, but to decide according to their relative merits for the purpose of *breeding*.

2. If, in the opinion of the Judges, there should be equality of merit, they will be instructed to make a special report to the Council, who will decide on the award.

3. The Judges will be instructed to withhold any prize if they are of opinion that there is not sufficient merit in any of the stock exhibited for such prize to justify an award; should, however, the question of disqualifying a whole class arise, the Judges shall consult with the Stewards of the yard, and their joint decision shall be final.

4. The Judges will be instructed to give in a *reserved number* in each class of live stock; viz., which animal would, in their opinion, possess sufficient merit for the prize in case the animal to which the prize is awarded should subsequently become disqualified.

5. In the classes for stallions, mares, and fillies, the Judges in awarding the prizes will be instructed, in addition to symmetry, to take activity and strength into their consideration.

6. The Judges will be instructed to deliver to the Director their award, signed, and stating the numbers to which the prizes are adjudged, before they leave the yard.

CONDITIONS RELATING TO MACHINERY.

STEAM-ENGINES.

All engines must be fitted with a steam-indicator, in addition to the ordinary spring-balance.

STEAM CULTIVATION.

1. The implements for steam cultivation will be tested dynamometrically, if possible, and such experiments made as will enable the Judges to ascertain the relative value in usefulness of each implement.

2. The steam boiler of each engine must be provided with a pipe or tube, the thread of which must be equal to the "half-inch gas-pipe thread," for the purpose of attaching a forcing pump; and each boiler will be tested to any

pressure the exhibitor thinks fit; but a pressure not exceeding one-half the "test" pressure is the utmost that will be allowed at any time during the whole time the *steam is up* for the Judges' purposes.

3. Any engine which is entered for competition, or for working in the yard of "machinery-in-motion," which, from defect in construction or any other cause, is, in the opinion of the Judges and Consulting Engineer, *unsafe*, shall not be allowed to work on the Society's premises; and further, the word '*unsafe*' shall be attached to the engine during the remainder of the exhibition.

4. The brick and tile machines will be tested by a dynamometer, where practicable; and machines intended to be worked by steam power must be provided with proper riggers, pulleys, or drums, for the application of power to the machines. Those machines intended to be worked by hand-power must be provided with a pulley not less than 4 inches wide; and such pulley or rigger must not be less in radius than the radius of the crank which is sent with the machine, and by which it is usually worked.

5. Every Exhibitor of pipe-machines will be expected to bring a die, 2½ inches diameter, with the "button" or "triblet" 2 inches diameter; and the machine must cut the pipes to the length of 13½ inches: also other dies, with triblets, for pipes varying from 1 to 4 inches diameter, or for larger pipes, if the machine is capable of making them.

6. The ploughs to be drawn by horses will be tested by the dynamometer, care being taken that the state of the land, the depth and width of furrow, be as nearly equal as possible in each set of experiments.

⁂ Forms of Certificate for entry, as well as Prize-Sheets for the Newcastle Meeting, containing the whole of the conditions and regulations, may be obtained at the Office of the Society, No. 12, Hanover Square, London.

DATES OF ENTRY.

CERTIFICATES for the entry of Implements for the Newcastle Meeting must be forwarded to the Secretary of the Society, No. 12, Hanover Square, London (W.), by the 1st of May, and Certificates for the entry of Live Stock by the 1st of June. Certificates received after those respective dates will not be accepted, but returned to the persons by whom they have been sent.

The Prizes of the Royal Agricultural Society of England, and all Prizes offered by the Newcastle Local Committee, are open to general competition.

THE following is the distribution of the Prizes awarded in the Heifer Classes at the Worcester Meeting, the Prizes in which were reserved till Certificates were received of their having respectively produced a live-calf before the 31st January, 1864.

SHORT-HORNS.

LADY PIGOT's First Prize Heifer, "Rosedale," calved a dead calf.
RICHARD BOOTH's Second Prize Heifer, "Queen of the May 2nd," not in calf.
COLONEL TOWNELEY's Silver Medal Heifer, "Roan Knight's Butterfly," takes First Prize.
COLONEL TOWNELEY's Reserved Number Heifer, "Royal Butterfly's Duchess," takes Second Prize.

SUSSEX.

MESSRS. HEASMAN's First Prize Heifer, "Battersea," slung her calf in October from being knocked about on the railway.

The remainder of the In-calf Heifers to which Prizes were awarded at Worcester have produced calves in accordance with the conditions.

H. HALL DARE, Secretary.

January 31st, 1864.

Essays and Reports.

AWARDS FOR 1862.

Class I.

Agriculture of Staffordshire, Prize not awarded: only one Essay sent in.

Class II.

The Essays in this Class were not considered worthy of the Prize.

Class III.

The Prize of 20*l.* was awarded to Mr. Robert Valentine, of Burcott, Wing, Leighton Buzzard, for his Essay on Steam Power and Thrashing Machines.

Class IV.

The Prize of 10*l.* was awarded to Mr. T. Bowick, of Bedford, for his Essay on Haymaking.

Class VI.

In this Class there was no competition.

Class VIII.

The Prize of 10*l.* was awarded to Mr. T. Bowick, of Bedford, for his Essay on the Management of a Home Farm.

AWARDS FOR 1863.

CLASS II.

The Prize of 25*l.* was awarded to Professor GAMGEE, of the New Veterinary College, Edinburgh, for his Essay on Breeding Hunters and Roadsters.

CLASS III.

The Prize of 25*l.* was awarded to Mr. W. J. MOSCROP, of Kirkleatham, Redcar, for his Essay on Steam Cultivation.

CLASS IV.

The Prize of 25*l.* was awarded to Mr. CHARLES BELCHER, of Little Coxwell, Faringdon, for his Essay on Reclaiming Waste Lands.

CLASS V.

The Essays in this Class were not considered worthy of the Prize.

CLASS VIII.

No Prize awarded.

PRIZES OFFERED BY THE WORCESTER LOCAL COMMITTEE.

The Prize of 20*l.* was awarded to Mr. CLEMENT CADLE, of Ballingham Hall, Ross, for his Essay on the Management of an Orchard.

[illegible] of 20*l.* was awarded to Mr. CLEMENT CADLE for his [illegible] Manufacture and Preservation of Cider and Perry.

The Prize of 20*l.* was awarded to Mr. P. SMITH, of Wick, Worcester, for his Essay on the Cultivation of Hops.

Members' Privileges of Chemical Analysis.

The Council have fixed the following rates of Charge for Analyses to be made by the Consulting Chemist for the *boná-fide* use of Members of the Society; who (to avoid all unnecessary correspondence) are particularly requested, when applying to him, to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens, must be paid to him by members at the time of their application.

No. 1.—An opinion of the genuineness of Peruvian guano, bone-dust, or oil-cake (each sample)	5*s*.
„ 2.—An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts, and ammonia	10*s*.
„ 3.—An estimate of the value (relatively to the average of samples in the market) of sulphate and muriate of ammonia, and of the nitrates of potash and soda	10*s*.
„ 4.—An analysis of superphosphate of lime for soluble phosphates only	10*s*.
„ 5.—An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia ..	£1.
„ 6.—An analysis (sufficient for the determination of its agricultural value) of any ordinary artificial manure	£1.
„ 7.—Limestone:—the proportion of lime, 7*s*. 6*d*.; the proportion of magnesia, 10*s*.; the proportion of lime and magnesia	15*s*.
„ 8.—Limestone or marls, including carbonate, phosphate, and sulphate of lime, and magnesia with sand and clay ..	£1.
„ 9.—Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1.
„ 10.—Complete analysis of a soil	£3.
„ 11.—An analysis of oil-cake, or other substance used for feeding purposes; showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre; as well as of starch, gum, and sugar, in the aggregate	£1.
„ 12.—Analyses of any vegetable product	£1.
„ 13.—Analyses of animal products, refuse substances used for manure, &c. .. .. from 10*s*. to	30*s*.
„ 14.—Determination of the "hardness" of a sample of water before and after boiling	10*s*.
„ 15.—Analysis of water of land drainage, and of water used for irrigation	£2.
„ 16.—Determination of nitric acid in a sample of water	£1.

N.B.—*The above Scale of Charges is not applicable to the case of persons commercially engaged in the Manufacture or Sale of any Substance sent for Analysis.*

The Address of the Consulting Chemist of the Society is, Dr. Augustus Voelcker, 101, Leadenhall Street, London, E.C., to which he requests that all letters and parcels (postage and carriage paid) should be directed.

Members' Veterinary Privileges.

I.—Serious or Extensive Diseases.

No. 1. Any Member of the Society who may desire professional attendance and special advice in cases of serious or extensive disease among his cattle, sheep, or pigs, and will address a letter to the Secretary, will, by return of post, receive a reply stating whether it be considered necessary that Professor Simonds, the Society's Veterinary Inspector, should visit the place where the disease prevails.

No. 2. The remuneration of the Inspector will be 2*l*. 2*s*. each day as a professional fee, and 1*l*. 1*s*. each day for personal expenses; and he will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. The fees will be paid by the Society, but the travelling expenses will be a charge against the applicant. This charge may, however, be reduced or remitted altogether at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

No. 3. The Inspector, on his return from visiting the diseased stock, will report to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

No. 4. When contingencies arise to prevent a personal discharge of the duties confided to the Inspector, he may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—Ordinary or Other Cases of Disease.

Members may obtain the attendance of the Veterinary Inspector on any case of disease by paying the cost of his visit, which will be at the following rate, viz., 2*l*. 2*s*. per diem, and travelling expenses.

III.—Consultations without Visit.

Personal consultation with Veterinary Inspector	5*s*.
Consultation by letter	5*s*.
Consultation necessitating the writing of three or more letters.	10*s*.
Post-mortem examination, and report thereon	10*s*.

A return of the number of applications during each half-year being required from the Veterinary Inspector.

IV.—Admission of Diseased Animals to the Veterinary College; Investigations, Lectures, and Reports.

No. 1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the same terms as if they were Members of the College; viz., by paying for the keep and treatment of cattle 10*s*. 6*d*. per week each animal, and for sheep and pigs "a small proportionate charge to be fixed by the Principal according to circumstances."

No. 2. The College has also undertaken to investigate such particular classes of disease, or special subjects connected with the application of the Veterinary art to cattle, sheep, and pigs, as may be directed by the Council.

No. 3. In addition to the increased number of lectures now given by Professor Simonds—the Lecturer on Cattle Pathology—to the pupils in the Royal Veterinary College, he will also deliver such lectures before the Members of the Society, at their house in Hanover Square, as the Council shall decide.

No. 4. The Royal Veterinary College will from time to time furnish to the Council a detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary.

Royal Agricultural Society of England.

1864–5.

President.

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VERNON, Hon. AUGUSTUS H., *Sudbury, Derby.*
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WILSON, Professor, *Iver, Uxbridge, Bucks.*
WYNN, Sir WATKIN WILLIAMS, Bart, M.P., *Rhuabon, Denbighshire.*

Secretary.

H. HALL DARE, 12, *Hanover Square, London,* **W.**

Editor—P. H. FRERE, 56, *Regent Street, Cambridge.*
Consulting-Chemist—Dr. AUGUSTUS VOELCKER, 101, *Leadenhall Street,* **E.C.**
Veterinary-Inspector—JAMES BEART SIMONDS, *Royal Veterinary College,* **N.W.**
Consulting Engineer—JAMES EASTON, or C. E. AMOS, *Grove, Southwark,* **S.E.**
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Bramston, T. W., M.P.
Hobbs, Wm. Fisher.
Torr, William.

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Chairman of Finance Committee.
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Bramston, T. W., M.P.
Challoner, Colonel.
Gibbs, B. T. Brandreth.
Hobbs, Wm. Fisher.

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*** The PRESIDENT, TRUSTEES, and VICE-PRESIDENTS are Members *ex officio* of all Committees.

MEMORANDA.

Address of Letters.—The Society's office being situated in the postal district designated by the letter W, members, in their correspondence with the Secretary, are requested to subjoin that letter to the usual address.

General Meeting in London, in December, 1864.

General Meeting in London, May 22, 1865, at Twelve o'clock.

Meeting at Plymouth, in 1865.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Weekly Council (for practical communications), at 12 o'clock on all Wednesdays in February, March, April, May, June, July, and November, excepting the first Wednesday in each of those months, and during adjournment: open to all Members of the Society, who are particularly invited by the Council to avail themselves of this privilege.

Adjournments.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

Diseases of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society; and of sending animals to the Royal Veterinary College, on the same terms as if they were subscribers to the College.—(A statement of these privileges will be found in the present Appendix.)

Chemical Analysis.—The privileges of Chemical Analysis enjoyed by Members of the Society will be found stated in the Appendix of the present volume.

Local Cheques.—Members are particularly requested not to forward Country Cheques for payment in London; but London Cheques, or Post-office Orders on Vere-street (payable to H. Hall Dare), in lieu of them. All Cheques are required to bear upon them a penny draft or receipt stamp, which must be cancelled in each case by the initials of the drawer. They may also conveniently transmit their Subscriptions to the Society, by requesting their Country Bankers to pay (through their London Agents) the amount at the Society's Office (No. 12, Hanover Square, London), between the hours of ten and four, when official receipts, signed by the Secretary, will be given for such payments.

New Members.—Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the full name, usual place of residence, and post-town, of the candidate, either at a Council meeting, or by letter addressed to the Secretary.

Packets by Post.—Packets not exceeding two feet in length, width, or depth, consisting of written or printed matter (but not containing letters sealed or open), if sent without envelopes, or enclosed in envelopes open at each end, may be forwarded by the inland post, if stamped, at the following rates:—

For a packet not exceeding	4 ounces	(or quarter of a pound) . . .	1 penny
„ „ „	8 „	(or half a pound)	2 pence.
„ „ „	16 „	(or one pound)	4 „
„ „ „	24 „	(or one pound and a half) . .	6 „
„ „ „	32 „	(or two pounds)	8 „

[And so on in the proportion of 8 ounces for each additional 2d.]

*** Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-Laws, of a Statement of the General Objects, &c., of the Society, of Chemical and Veterinary Privileges, and of other printed papers connected with special departments of the Society's business.

Royal Agricultural Society of England.

GENERAL MEETING,

12, HANOVER SQUARE, MONDAY, MAY 23, 1864.

REPORT OF THE COUNCIL.

THE Council have the gratification of announcing that since the last General Meeting in December, His Royal Highness the Prince of Wales has allowed his name to be enrolled in the list of your Governors.

During the past five months the names of 5 Governors and 136 members have been removed from the list by death and retirement, while 1 Governor and 232 members have been elected; so that the Society now consists of—

78 Life Governors,
45 Annual Governors,
1,343 Life Members,
4,013 Annual Members,
17 Honorary Members,

making a total of 5,496, being an increase of 53 names.

The Council have elected Major-General the Hon. Alexander Nelson Hood as a Vice-President, in the room of Lord Ashburton, deceased.

The half-yearly statement of accounts to the 31st December, 1863, has been examined and approved by the auditors and accountants of the Society, and together with the Balance-Sheet for the whole year 1863, and a statement of the Country Meeting account for Worcester, has been published in the last number of the 'Journal.' The funded capital stands at 16,488*l.* 17*s.* 10*d.* in the New Three per Cents.; 3000*l.* has been placed on deposit at interest with the Society's bankers, and the current cash balance in their hands on the 1st inst. was 2836*l.* 6*s.* 6*d.*

Papers have been read at the Weekly Meetings by Mr. Lawes, on "Salt used as a Manure;" by Mr. Hughes, on "The Cultivation and Management of Clay Farms;" by Mr. Holland, M.P., on "Agricultural Education;" and by Professor Voelcker, on "Nutrition of Plants by the Atmosphere."

A Committee has been appointed to consider the measures which ought to be taken for the improvement of the education of those who depend upon the cultivation of the soil for their support, this being declared by the Charter as the seventh national object to be prosecuted by the Society.

The Lords Commissioners of Her Majesty's Treasury having applied to the Society for assistance in carrying out their design of presenting some sheep to the Viceroy of Egypt, who is anxious to improve his native breeds by crossing, a selection was made under the direction of the President; and a communication has been received of the safe arrival of the sheep at Cairo.

A Special Committee having been appointed to consider the question of the dates of calving, the Council have approved of their recommendation, that any alteration in the date of calving would be inconvenient and thus unadvisable.

The arrangements for the Newcastle Meeting, to be held during the week commencing Monday the 18th July, are proceeding satisfactorily. The show-yard will be open as under:—

	s.	d.
Monday	10	0
Tuesday	2	6
Wednesday	2	6
Thursday	1	0
Friday	1	0

The Council have determined that the Annual Country Meeting in 1865 shall be held at Plymouth.

The district for the Country Meeting of 1866 will include the counties of Cambridgeshire, Essex, Hertfordshire, Huntingdonshire, Norfolk, and Suffolk.

By Order of the Council,

H. Hall Dare,

Secretary.

DR. HALF-YEARLY CASH ACCOUN

	£.	s.	d.	£.	s.	d.	£.	s.
To Balance in hand, 1st January, 1864:—								
Bankers				443	12	6		
Secretary				17	13	5		
							461	5 1
To Income, viz.:—								
Dividends on Stock				240	2	5		
Subscriptions:—								
Governors' Annual	380	0	0					
Members' Life-Compositions ..	390	0	0					
Members' Annual..	3291	7	0					
				4061	7	0		
Journal:—								
Sales				89	14	0		
				4391	3	5		
To Country Meetings:—								
Worcester	7	5	0					
Newcastle-on-Tyne	3498	7	0					
				3505	12	0		
							7896	1
							£8358	

BALANCE-SHI

LIABILITIES.	£.	s.	d.	£.	s.	d.	£.
To Capital:							
Surplus, 31st December, 1863				..	..	..	18,342 1
Surplus of Income over the Expenditure during the Half-year, viz:—							
Income	4391	3	5				
Expenditure	1331	8	6				
				3059	14	11	
Less Worcester Meeting:—							
Amount at debit of this account				47	15	0	
							3,011 1
							£21,354 1

(Signed) W. FISHER HOBBS, *on behalf of Finance Committ*

ANUARY TO 30TH JUNE, 1864. CR.

	£.	s.	d.	£.	s.	d.	£.	s.	d.
re:—									
ent—									
Salaries and Wages ..	327	6	0						
xpenses, Rent, Taxes, &c.	269	5	6						
				596	11	6			
and Advertising, &c. ..	107	7	0						
ats	3	17	0						
Salary	250	0	0						
				361	4	0			
—									
r Investigations, 1864 ..	200	0	0						
ng Chemist's Salary ..	75	0	0						
				275	0	0			
.. ..				8	19	6			
d Carriage				44	1	6			
ients				13	12	0			
.. ..				16	19	0			
ns returned (paid in error)				15	1	0			
				1331	8	6			
leetings:—									
.. ..	55	0	0						
on-Tyne	1141	16	7						
				1196	16	7			
							2528	5	1
hand:—									
h London and Westminster Bank ..				3000	0	0			
.. ..	2817	3	11						
.. ..	12	12	4						
				2829	16	3			
							5829	16	3
							£8358	1	4

, 1864.

ASSETS.	£.	s.	d.	£.	s.	d.
nd	2,829	16	3			
count at Bankers	3,000	0	0			
cent. Stock, 16,488*l.* 17*s.* 10*d.* cost ..	15,881	11	1			
Furniture in Society's House	2,000	0	0			
				23,711	7	4
e above Assets are exclusive of the recoverable in respect of arrears of tion to 30th June, 1864, which at e amounted to 737*l.*						
of Newcastle Meeting	.. ..			2,356	10	5
				£21,354	16	11

ed, audited, and found correct, this 2nd day of August, 1864.

igned) WILLIAM COPELAND ASTBURY.
BALL, & Co., *Accountants.*

SHOW AT NEWCASTLE-UPON-TYNE, JULY, 1864.

STEWARDS OF THE YARD.

Stock.

Richard Milward.
John D. Dent, M.P.
Charles Randell.

Implements.

William Torr.
Earl Cathcart.
The Hon. A. H. Vernon.

Forage.

Jacob Wilson.

Honorary Director of the Show.

B. T. Brandreth Gibbs.

STOCK JUDGES.

Short-horns.

T. Parkinson,
R. J. Wiley,
Joseph Robinson.

Herefords, Devons, and Sussex.

E. L. Franklin,
H. W. Keary,
E. Gough.

Channel Islands, and other Breeds.

John Hudson,
William Fisher Hobbs.

Polled, Horned, Ayrshire, and Galloways.

A. Glennie,
J. Murdock,
W. Fullerton.

Thorough-breds and Hunters.

J. Cookson,
H. Thurnall,
C. N. Nainby.

Hackneys and Ponies.

C. Bedford,
Ion. G. Lascelles.

Agricultural and Drays.

T. Brooks,
[illegible]. Botham,
[illegible] H Bland.

Suffolks and Clydesdales.

[illegible] Crosse
[illegible]

Leicesters and Lincolns.

J. B. Thompson,
L. Borman,
T. Greetham.

Cheviots, Border Leicesters, Black-Faced, and Herdwicks.

W. Aitchison,
William Smith,
J. Bowstead.

Cotswolds.

J. H. Bateman,
R. Lord.

Oxford and Hampshire Downs.

F. Budd,
R. J. Newton,
E. Little.

Shropshire.

J. Woods,
J. Price.

Southdowns.

J. H. Fookes,
J. S. Turner,
J. Purves.

Pigs.

J. Woolf,
D. Nesham,
J. Moon.

WOOL JUDGES.

T. Clayton, Jason Gurney.

BUTTER JUDGES.

T. Hunnam, J. Marshall.

Inspector of Shearing.

S. Druce.

Veterinary-Inspectors.

Professor Simonds, Professor Varnell.

Assistant.—R. L. Hunt.

IMPLEMENT JUDGES.

Steam-Cultivators.

D. K. Clark, C.E.,
H. B. Caldwell,
J. Coleman,
C. S. Read,
F. Sherborn, Jun.

Ploughs.

T. Dods,
E. Wortley,
T. P. Outhwaite.

Cultivators, Clod-Crushers, Rollers, and Harrows.

John Hickin,
John Thompson.

Brick and Tile Machines and Miscellaneous.

W. Tindall,
Gilson Martin.

Consulting-Engineer.

C. E. Amos.

AWARD OF PRIZES.

NOTE.—The Judges were instructed to give in a *Reserved Number* to one animal in each Class, viz., the animal which would in their opinion possess sufficient merit for the Prize, in case an animal to which a Prize was awarded should subsequently become disqualified. If ten animals or pens were exhibited in any Class, a Silver Medal might be awarded to the Third best.

CATTLE.

Short-horn Bulls and Bull Calves.

AMOS CRUICKSHANK, Sittyton, Whiterashes, Aberdeenshire: FIRST PRIZE, 25*l.*, for "Forth," roan, 4 years 5 months 6 days-old; bred by William Stirling, M.P., Keir, Dumblane, Perthshire; sire, "Florist" (16,064); dam, "Anna Rose;" sire of dam, "John o'Groat" (13,090).

VISCOUNT STRATHALLAN, Strathallan Castle, Auchterarder, Perthshire: SECOND PRIZE, 15*l.*, for "Fosco," white, 3 years 6 months 2 weeks 2 days-old; bred by exhibitor; sire, "Redgauntlet;" dam, "Frolic;" sire of dam, "Barnaby Rudge."

DAVID REYNOLDS DAVIES, Mere Old Hall, Knutsford, Cheshire: THIRD PRIZE, Silver Medal, for "Ebor," roan, 3 years 9 months-old; bred by Mr. Barker, Donnington; sire, "Horner" (14,714); dam, "Lady Mayoress;" sire of dam, "Voltigeur."

JOHN CHARLESWORTH, Headfield, Dewsbury, Yorkshire: the *Reserved Number*, to "General Murat" (17,955), roan, 4 years 2 months 3 weeks-old; bred by exhibitor; sire, "Prince Talleyrand" (16,765); dam, "Village Belle;" sire of dam, "Grand Turk" (12,968).

WILLIAM STIRLING, M.P., Keir, Dunblane, Perthshire: FIRST PRIZE, 25*l.*, for "Royal Butterfly 11th" (20,719), roan, 2 years 11 months 3 weeks 6 days-old; bred by Colonel Charles Towneley, Towneley Park, Burnley, Lancashire; sire, "Royal Butterfly" (16,862); dam, "Pageant;" sire of dam, "Count Glo'ster" (12,650).

JONATHAN PEEL, Knowlmere Manor, Clitheroe: SECOND PRIZE, 15*l.*, for "Abbot of Knowlmere," roan, 2 years 3 months 1 day-old; bred by exhibitor; sire, "The Monk" (11,824); dam, "Princess Maud;" sire of dam, "Prince Arthur" (13,497).

RICHARD EASTWOOD, Thorney Holme, Clitheroe, Lancashire: THIRD PRIZE, Silver Medal, for "The Hero," white, 2 years 1 month 3 weeks-old; bred by exhibitor; sire, "Priam" (16,710); dam, "Heroine;" sire of dam, "Bridesman" (2,493).

ROBERT GELL, Grimston Lodge, York: the *Reserved Number*, to "Master Goldschmidt" (20,305), roan, 2 years 5 months 5 days-old; bred by exhibitor; sire, "The Rajah" (18665); dam, "Jenny Lind;" sire of dam, "Vanguard" (10,994).

THOMAS WILLIS, Manor House, Carperby, Bedale, Yorkshire: FIRST PRIZE, 25*l.*, for "Baron Crossley" (19,269), roan, 1 year 11 months-old; bred by exhibitor; sire, "Royal Alfred" (18,748); dam, "Flower Girl;" sire of dam, "Gipsy King" 11,532).

ARTHUR JAMES BALFOUR, Whittingham, Prestonkirk, Haddingtonshire: SECOND PRIZE, 25*l.*, for "Prince Loth," roan, 1 year 5 months 5 days-old; bred by exhibitor; sire, "Great Seal" (19,905); dam, "Rose of May;" sire of dam, "Sir James the Rose" (15,290).

RICHARD BOOTH, Warlaby, Northallerton, Yorkshire: THIRD PRIZE, Silver Medal, for "Prince of Battersea," red and white, 1 year 9 months 3 weeks 4 days-old, bred by exhibitor; sire, "Prince Arthur" (13,497); dam, "Queen of the Ocean;" sire of dam, "Crown Prince" (10,087).

FRANCIS HAWKSWORTH FAWKES, Farnley Hall, Otley, Yorkshire: the *Reserved Number*, to "Lord Surrey," roan, 1 year 2 months 3 weeks 4 days-old; bred by exhibitor: sire, "Lord Cobham" (20,164); dam, "She's coming again;" sire of dam, "Laudable" (9282).

FRANCIS HAWKSWORTH FAWKES: FIRST PRIZE, 10*l.*, for "Marquis," red, 9 months 1 week, 4 days-old; bred by exhibitor; sire, "Royal Oak" (16,873); dam, "Marchioness;" sire of dam, "Robinson Crusoe" (13,610).

RICHARD BOOTH, Warlaby, Northallerton, Yorkshire: SECOND PRIZE, 5*l.*, for "British Crown," roan, 9 months 3 weeks 3 days-old; bred by exhibitor; sire, "Lord of the Valley" (14,837); dam, "Bridal Wreath;" sire of dam, "Crown Prince" (10,087).

ROBERT HARRETT, Kirkwhelpington, Newcastle-on-Tyne: THIRD PRIZE, Silver Medal, for "Talleyrand," roan, 6 months 2 weeks 2 days-old; bred by exhibitor; sire, "Gipsy Prince" (17,965); dam, "Moss Rose;" sire of dam, "Moss Trooper" (13,357).

LORD BRAYBROOKE, Audley End, Saffron Walden, Essex: the *Reserved Number*, to "Volunteer," white, 11 months 2 weeks 4 days-old; bred by exhibitor; sire, "Englishman" (19,701); dam, "Lady Augusta Burdett;" sire of dam, "Young Duke of Cambridge" (14,433).

Short-horn Cows and Heifers.

SIR MATTHEW WHITE RIDLEY, Bart., M.P., Blagdon, Cramlington, Northumberland: FIRST PRIZE, 20*l.*, for "Evelina 4th," dark roan, 4 years 2 months 3 days-old, in-calf; bred by exhibitor; sire, "Sir Colin" (16,953); dam, "Evelina;" sire of dam, "Lauderdale."

JAMES DOUGLAS, Athelstaneford Farm, Drem, Haddingtonshire: SECOND PRIZE, 10*l.*, for "Lady of Athelstane," red and white, 7 years 3 months 3 weeks 5 days-old, in-milk and in-calf; bred by exhibitor; sire, "Hymen" (13,058); dam, "Playful;" sire of dam, "Fourth Duke of York" (10,167).

RICHARD STRATTON, Walls Court, Stapleton, Bristol: THIRD PRIZE, Silver Medal, for "Luna," roan, 4 years 4 months 2 weeks-old, in-milk; bred by exhibitor; sire, "The Baronet" (17,088); dam, "Lena;" sire of dam, "Hickory."

JAMES DOUGLAS, Athelstaneford Farm, Drem, Haddingtonshire, the *Reserved Number*, to "Queen of Athelstane," red, 4 years 2 months 2 days-old, in-milk: bred by exhibitor; sire, "Sir James the Rose" (15,290); dam, "Playful;" sire of dam, "Fourth Duke of York."

JAMES DOUGLAS: FIRST PRIZE, 15*l.*, for "Pride of Athelstane," red and white, 2 years 11 months 3 weeks 4 days-old, in-milk; bred by exhibitor; sire, "Sir James the Rose" (15,290); dam, "Lady of Athelstane;" sire of dam, "Hymen" (13,058).

WILLIAM LAMBERT, Elrington Hall, Haydon Bridge, Northumberland: SECOND PRIZE, 10*l.*, for "Queen of Beauty," white, 2 years 2 months 1 week 2 days-old, in-calf; bred by exhibitor; sire, "Master Annandale" (14,916); dam, "Garland;" sire of dam, "Speculation" (8621).

RICHARD STRATTON: THIRD PRIZE, Silver Medal, for "Diadem," rich roan, 2 years 5 months 2 weeks 3 days-old, in-calf; bred by exhibitor; sire, "Warwick" (19,120); dam, "Lotus;" sire of dam, "Buckingham" (15700).

RICHARD EASTWOOD, Thorney Holme, Clitheroe, Lancashire: the *Reserved Number*, to "Barmpton Butterfly," rich roan, 2 years 7 months 3 weeks 2 days-old, in-milk; bred by Colonel Towneley, Towneley Park, Burnley; sire, "Royal Butterfly" (16,682); dam, "Young Barmpton Rose;" sire of dam, "Richard Cœur de Lion" (13,590).

GEORGE SAVILE FOLJAMBE, Osberton Hall, Worksop, Notts: FIRST PRIZE, 15*l.*, for "Gipsey Queen," roan, 1 year 8 months 2 weeks-old; bred by exhibitor; sire, "Imperial Windsor;" dam, "Sibyl;" sire of dam, "May Duke."

A. and A. MITCHELL, Alloa, Clackmannanshire: SECOND PRIZE, 10*l.*, for "Blue Belle," roan, 1 year 4 months 3 weeks 6 days-old; bred by exhibitors; sire, "Knight Errant" (18,154); dam, "Barbelle;" sire of dam, "Cardigan" (12,556).

RICHARD EASTWOOD, Thorney Holme, Whitewell, Lancashire: THIRD PRIZE, Silver Medal, for "Royal Butterfly's Pageant," red and white, 1 year 10 months 3 weeks 5 days-old, in-calf; bred by Colonel Towneley, Towneley Park, Burnley; sire, "Royal Butterfly" (16,862); dam, "Pageant;" sire of dam, "Count Glo'ster" (12,650).

RICHARD BOOTH, Warlaby, Northallerton, Yorkshire: the *Reserved Number*, to "Lady Fragrant," roan, 1 year 4 months-old; bred by exhibitor; sire, "Lord of the Valley" (14,837); dam, "Lady Blithe;" sire of dam, "Windsor" (14,013).

SIR ANTHONY DE ROTHSCHILD, Bart., Aston Clinton, Tring, Buckinghamshire: SECOND PRIZE, 10*l.*, for "Isabella Graceful," red with little white, 10 months 3 weeks 5 days-old; bred by exhibitor; sire, "Fortunatus" (19,773); dam, "Graceful;" sire of dam, "Shrewsbury" (20,801).

LORD FEVERSHAM, Duncombe Park, Helmsley, Yorkshire: SECOND PRIZE, 5*l.*, for "Princess," roan, 9 months 5 days-old; bred by exhibitor; sire, "Vesuvius;" dam, "Lady in White;" sire of dam, "Skyrocket."

JAMES DOUGLAS: THIRD PRIZE, Silver Medal, for "Princess of Athelstane," red, 11 months 3 weeks 4 days-old; bred by exhibitor; sire, "Watchman" (17,216); dam, "Queen of Athelstane;" sire of dam, "Sir James the Rose" (15,290).

THOMAS EDWARD PAWLETT, Beeston, Sandy, Bedfordshire: the *Reserved Number*, to "Fair Belle," white, 11 months 1 week 2 days-old; bred by exhibitor; sire, "Englishman" (19,701); dam, "Daisy;" sire of dam, "Merry Lad" (14,947).

Hereford Bulls and Bull Calves.

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: FIRST PRIZE, 25*l.*, for "Tambarine" (2254), red, white face, 3 years 10 months 2 weeks-old; bred by Lord Bateman, Shobdon Court, Leominster; sire, "Carlisle" (923); dam, "Little Beauty;" sire of dam, "Andrew the Second" (612).

JOHN MEREDITH, The Heldre, Half-way House, Shrewsbury: SECOND PRIZE, 15*l.*, for "Sunbeam" (2248), red, white face and mane, 3 years 7 months, 2 weeks 6 days-old; bred by T. L. Meire, Cound Harbour, Shrewsbury; sire, "Frankey" (1243); dam, "Rose;" sire of dam, "Cound" (1193).

JOHN ALBERT HOLLINGS, How Caple, Ross, Herefordshire: the *Reserved Number*, to "Chieftain the Second" (1917), red, white face, 3 years 11 months 3 weeks-old; bred by the late James Rea, Monaughty, Knighton; sire, "Wellington" (1112); dam, "Gertrude;" sire of dam, "Chieftain" (930).

JOHN BALDWIN, Luddington, Stratford-on-Avon, Warwickshire: FIRST PRIZE 25*l.*, for "Battersea" (1865), red and white, 2 years 11 months 2 weeks 1 day-old; bred by Charles Vevers, Ivington Park, Leominster; sire, "Corn Exchange" (1935); dam, "Pigeon;" sire of dam, "Young Sir Andrew" (1471).

GEORGE PITT, Chadnor Court, Dilwyn, Leominster, Herefordshire: SECOND PRIZE, 15*l.*, for "San Jacinto," red with white face, 2 years 10 months 1 week 3 days-old; bred by exhibitor; sire, "Hatfield;" dam, "Duchess;" sire of dam, "White Nob."

JAMES MARSH READ, Elkstone, Cheltenham, Gloucestershire: the *Reserved Number*, to "Peremptorily," red with white face, 2 years 5 months 3 weeks 3 days-old; bred by exhibitor; sire, "Caliban" (1163); dam, "Beauty;" sire of dam, "Dodmore" (1217 A).

THOMAS DUCKHAM, Baysham Court, Ross, Herefordshire: FIRST PRIZE, 25*l.*, for "Commodore," red, white face, 1 year 10 months 3 weeks 2 days-old; bred by exhibitor; sire, "Castor" (1900); dam, "Carlisle;" sire of dam, "Albert Edward" (859).

EDMUND WRIGHT, Halston Hall, Oswestry, Salop: SECOND PRIZE, 15*l.*, for "Lion," red, white face, 1 year 11 months 3 weeks 4 days-old; bred by exhibitor; sire, "Magnet 2nd" (989); dam, "Lioness;" sire of dam, "Carlisle" (923).

WILLIAM TAYLOR, Showle Court, Ledbury, Herefordshire: the *Reserved Number*, for "Tambarine the Second," red, white face, 1 year 5 months 2 weeks-old; bred by exhibitor; sire, "Tambarine" (2254); dam, "Dewsall;" sire of dam, "Hereford" (968).

EDMUND WRIGHT, Halston Hall, Oswestry, Salop: FIRST PRIZE 10*l.*, for "Sir John," red, white face, 9 months 1 week 5 days-old; bred by exhibitor; sire, "Silver Horn" (2213); dam, "Sweetmeat;" sire of dam, "Magnet 2nd" (989).

THOMAS SKINNER BRADSTOCK, Cobrey Park, Ross, Herefordshire: SECOND PRIZE, 5*l.*, for his red, white face and mane, 10 months 1 week 1 day-old; bred by exhibitor; sire, "Young Rambler;" dam, "Maria;" sire of dam, "Berwick."

Hereford Cows and Heifers.

LOUISA WOODGATE REA, Westonbury, Pembridge, Leominster, Herefordshire: FIRST PRIZE, 20*l.*, for "Spangle the 2nd," red, white face, 4 years 9 months 2 weeks 1 day-old, in-milk; bred by the late Mr. James Rea, Monaughty, Knighton; sire, "Wellington;" dam, "Spangle."

LOUISA WOODGATE REA, Westonbury: SECOND PRIZE, 10*l*., for "Kate the 2nd," red, white face, 5 years 8 months 4 weeks 1 day-old, in-milk; bred by the late Mr. Thomas Rea, Westonbury; sire, "Sir Benjamin;" dam, "Kate."

GEORGE PITT, Chadnor Court, Dilwyn, Leominster: the *Reserved Number*, to "Sunshine," light red, 3 years 6 months 2 weeks 2 days-old, in-milk and in-calf; bred by exhibitor; sire, "Luck's All;" dam, "Handsome;" sire of dam, "Plunder."

JOHN BALDWIN, Luddington, Stratford-on-Avon, Warwickshire: FIRST PRIZE, 15*l*., for "Duchess of Bedford 2nd," red and white, 2 years 9 months 1 week-old, in-calf; bred by Thomas Roberts, Ivington Bury, Leominster, Herefordshire; sire, "Sir Thomas" (2228); dam, "Duchess of Bedford;" sire of dam, "Arthur Napoleon" (910).

JAMES TAYLOR, Stretford Court, Leominster: SECOND PRIZE, 10*l*., for, "Dainty 9th," red, mottle face, 2 years 11 months 2 weeks 3 days-old, in-calf; bred by exhibitor; sire, "Croft" (937); dam, "Dainty 5th;" sire of dam, "St. Oswall" (1378).

JAMES MARSH READ, Elkstone, Cheltenham, Gloucestershire: the *Reserved Number*, for "Miss Southam," red, white face, 2 years 10 months 3 weeks 3 days-old, in-calf; bred by exhibitor; sire, "Caliban" (1163); dam, "Cherry 7th;" sire of dam, "Hotspur" (855).

JOHN BALDWIN, Luddington, Stratford-on-Avon, Warwickshire: FIRST PRIZE, 15*l*., for "Miss Hastings 2nd," red and white, 1 year 11 months 2 weeks 4 days-old; bred by Thomas Roberts, Ivington Bury, Leominster, Herefordshire; sire, "Sir Thomas" (2228); dam, "Lady Hastings;" sire of dam, "Master Butterfly" (1313).

MAJOR-GENERAL THE HON. A. N. HOOD, Cumberland Lodge, Windsor, Berkshire: SECOND PRIZE, 10*l*., for "Crown Princess," red and white, 1 year 9 months 4 weeks-old; bred by the exhibitor; sire, "Ajax" (1843); dam, "Juno;" sire of dam, "Brecon" (918).

JOHN MONKHOUSE, The Stow, Hereford: the *Reserved Number*, to "Isabel," red, white face, 1 year 4 months 3 days-old; bred by exhibitor; sire, "Chieftain;" dam, "Violet;" sire of dam, "Madoc."

JOHN MONKHOUSE: FIRST PRIZE, 10*l*., for "Fairy Queen," red, white face, 10 months 2 days old; bred by exhibitor; sire, "Chieftain;" dam, "Fairy;" sire of dam, "Formidable."

ANDREW ROUSE BOUGHTON KNIGHT, Downton Castle, Ludlow, Herefordshire: SECOND PRIZE, 5*l*., for "Greyling," grey, 8 months 2 weeks 1 day-old; bred by exhibitor; sire, "Lord Grey" (2085); dam, "Snowdrop;" sire dam, "Orleton" (901).

PHILIP TURNER, The Leen, Pembridge, Herefordshire: the *Reserved Number*, to "Pansy," red, white face, 11 months 3 weeks 3 days-old; bred by exhibitor; sire, "Bolingbroke" (1883); dam, "Florist;" sire of dam, "Felix" (953).

Devon Bulls and Bull Calves.

WALTER FARTHING, Stowey Court, Bridgewater, Somersetshire: FIRST PRIZE, 25*l*., for "Viscount," red, 4 years 7 months 2 weeks-old; bred by exhibitor; sire, "Sir Peregrine;" dam, "Molly;" sire of dam, "William."

James Merson, Brinsworthy, North Molton, Devonshire: Second Prize, 15*l.*, for "Young Salisbury" (761), red, 4 years 5 months 3 days-old; bred by exhibitor; sire, "Napoleon" (464); dam, "Duchess" (1296); sire of dam, "Uncle Tom."

John Azariah Smith, Bradford Peverill, Dorchester, Dorsetshire: First Prize, 25*l.*, for "Consitution," red, 2 years 3 months 4 weeks 1 day-old; bred by exhibitor; sire, "Exchange" (627); dam, "Rachel" (2307); sire of dam, "Palmerston" (476).

Major-General the Hon. A. Nelson Hood, Cumberland Lodge, Windsor, Berkshire: Second Prize, 15*l.*, for "Prince Alfred," 2 years 10 months 4 weeks-old; bred by H. R. H. the Prince Consort, of Windsor Castle; sire "Colonel" (387); dam, "Fancy" (703); sire of dam, "William."

Walter Farthing, Stowey Court, Bridgewater, Somersetshire: the *Reserved Number*, to "Stowey," red, 2 years 4 months 3 weeks-old; bred by J. K. Farthing, of Currypool, Bridgewater, Somersetshire; sire, "Sir Alexander;" dam, "Dairymaid;" sire of dam, "Baronet."

Walter Farthing: First Prize, 25*l.*, for "Marquis," red, 1 year 6 months-old; bred by exhibitor; sire, "Sir Peregrine;" dam, "Molly;" sire of dam, "William."

Walter Farthing: Second Prize, 15*l.*, for "Saint Andries," red, 1 year 8 months 4 days-old; bred by Sir A. A. Hood, Bart., M.P., of Saint Andries, Bridgewater; sire, "Perfection."

George Turner, Beacon Downes, Exeter, Devonshire: the *Reserved Number*, to "Van de Weyer," red, 1 year 6 months 2 weeks 4 days-old; bred by exhibitor; sire, "Champion;" dam, "Vaudine;" sire of dam, "Palmerston."

George Turner: First Prize, 10*l.*, for "Frederick 2nd," red, 7 months 3 weeks-old; bred by exhibitor; sire, "The Liberal;" dam, "Frederica;" sire of dam, "Prince Frederick."

Devon Cows and Heifers.

John Azariah Smith, Bradford Peverill, Dorchester, Dorsetshire: First Prize, 20*l.*, for "Young Hebe," red, 4 years 9 months 3 weeks 2 days-old, in-milk; bred by Lord Portman, of Bryanston, Blandford, Dorsetshire; sire, Davey's "Napoleon 3rd" (464); dam, "Hebe" (220); sire of dam, "Baronet" (6).

Walter Farthing, Stowey Court, Bridgewater, Somersetshire: Second Prize, 10*l.*, for "Cheerful," red, 8 years 1 month 1 week-old, in-milk; bred by Mr. Norrish, of Shoebrooke, Crediton, Devonshire.

John Azariah Smith: the *Reserved Number*, to "Young Gold Cup," red, 4 years 8 months 4 weeks 1 day-old, in-milk; bred by Lord Portman, of Bryanston, Blandford, Dorsetshire; sire, "Palmerston" (476); dam, "Gold Cup."

Walter Farthing, Stowey Court, Bridgewater, Somersetshire: First Prize, 15*l.*, for "Nelly," red, 2 years 2 months 1 week-old; bred by exhibitor; sire, "Sir Peregrine;" dam, "Nancy;" sire of dam, "Duke."

Charles Hambro, Milton Abbey, Blandford, Dorsetshire: Second Prize, 10*l.*, for "Miss Portman," red, 2 years 8 months 1 week-old, in calf; bred by Lord Portman, Bryanston, Blandford, Dorsetshire; sire, "Royal George;" dam, "Milkmaid;" sire of dam, "Royal George."

MAJOR-GENERAL THE HON. A. NELSON HOOD, Cumberland Lodge, Windsor, Berkshire: FIRST PRIZE, 15*l.*, for "Rose of Denmark," red, 1 year 11 months-old; bred by exhibitor; sire, "Colonel" (387); dam, "Fancy" (703); sire of dam, "William."

GEORGE TURNER, Beacon Downes, Exeter, Devon: SECOND PRIZE, 10*l.*, for "Lady Audley," red, 1 year 9 months 3 weeks-old; bred by exhibitor; sire, "The Little Known;" dam, "Fanny Fern;" sire of dam, "West Australian."

MAJOR-GENERAL THE HON. A. NELSON HOOD: the *Reserved Number*, to "Princess Louise," red, 1 year 7 months 4 weeks-old; bred by exhibitor; sire, "Saracen" (520*a*); dam, "Sweetbriar" (1665); sire of dam, "Zouave" (556).

WALTER FARTHING, Stowey Court, Bridgewater, Somersetshire: FIRST PRIZE, 10*l.*, for red, 8 months 1 week 3 days-old; bred by exhibitor; sire, "Viscount;" dam, "Julia;" sire of dam, "Lord Quantock."

Sussex Bulls.

GEORGE JENNER, Parsonage House, Udimore, Rye, Sussex: FIRST PRIZE, 10*l.*, for "The Earl" (96), red, 3 years 5 months-old; bred by Messrs. Heasman, Angmering, Arundel, Sussex; sire, "Marquis" (16); dam, "Countess" (30).

WILLIAM MARSHALL, Bolney Place, Cuckfield, Sussex: SECOND PRIZE, 5*l.*, for "Marmaduke," red, under 6 years-old; bred by E. Cane, Esq., Berwick Court, Lewes, Sussex; sire, "Unicorn;" dam, "Brandy;" sire of dam, "Gorringe."

Sussex Cows and Heifers.

GEORGE JENNER, Parsonage House, Udimore, Rye, Sussex: FIRST PRIZE, 10*l.*, for "Mayflower" (350), red, 7 years 4 months-old, in-milk and in-calf; bred by exhibitor; sire, "Stonham Bull;" dam, "Longford Cow."

WILLIAM MARSHALL, Manor House, Bolney, Cuckfield, Sussex: SECOND PRIZE, 5*l.*, for "Frost," red, 6 years, 5 months 3 weeks 3 days-old, in-milk; bred by exhibitor; sire, "Sultan;" dam, "Fill-pail."

GEORGE JENNER: the *Reserved Number*, for "Bishop" (635), red, 4 years 5 months-old, in-milk and in-calf; bred by exhibitor; sire, "Challenger" (33); dam, "Bishop Cow;" sire of dam, "Knell Bull."

WILLIAM MARSHALL, Manor House, Bolney, Cuckfield, Sussex: FIRST PRIZE, 10*l.*, for "Helen," red, 2 years 8 months 1 week-old, in-calf; bred by exhibitor; sire, "Havelock;" dam, "Hester;" sire of dam, "Chichester."

GEORGE JENNER, Parsonage House, Udimore, Rye, Sussex: SECOND PRIZE, 5*l.*, for "Mayflower Twin No. 1," red, 2 years 4 months 1 week 3 days-old, in-calf; bred by exhibitor; sire, "Challenger" (33); dam, "Mayflower" (350); sire of dam, "Stonham Bull."

WILLIAM MARSHALL: the *Reserved Number*, to his red, 2 years 8 months-old, in-calf; bred by exhibitor; sire, "Havelock;" dam, "Fill-pail;" sire of dam, "Chichester."

GEORGE JENNER, Parsonage House, Udimore, Rye, Sussex, FIRST PRIZE, 10*l.*, for "Selmes Heifer," red, 1 year, 5 months 2 weeks 3 days-old; bred by exhibitor; sire, "Challenger" (33); dam, "Selmes Cow;" sire of dam, "Stonham Bull."

GEORGE JENNER: SECOND PRIZE, 5*l.*, for "Princess," red, 1 year 3 months-old; bred by exhibitor; sire, "Challenger" (33); dam, "Princess;" sire of dam, "Stonham Bull."

WILLIAM MARSHALL, Manor House, Bolney, Cuckfield, Sussex: the *Reserved Number*, to his red, 1 year 7 months 2 weeks 3 days-old; bred by exhibitor; sire, "Prince Alfred;" dam, "Fanny;" sire of dam, "Havelock."

Channel Islands Bulls.

JAMES DUMBRELL, Ditchling, Hurstperpoint, Sussex: FIRST PRIZE, 10*l.*, for "King Charming," light grey, 2 years 6 months-old (Jersey); bred by Mr. Labey, Jersey; sire, "Prince Albert."

JAMES DUMBRELL: SECOND PRIZE, 5*l.*, for "Prince Arthur," grey and tan, 1 year 3 months 1 week 5 days-old (Jersey); bred by exhibitor; sire, "St. Helier;" dam, "Myrtle."

JAMES DUMBRELL: the *Reserved Number*, to "Wickham," dark grey and tan, 2 years 5 months-old (Jersey); bred by Mr. J. Labey, Grouville, Jersey.

Channel Islands Cows and Heifers.

JAMES DUMBRELL: FIRST PRIZE, 10*l.*, for "Lavender," grey and white, about 8 years-old (Jersey), in-calf; bred by M. Gibot, Jersey.

LAWRENCE FOWLER, Little Bushey Farm, Watford, Herts: SECOND PRIZE, 5*l.*, for "Primrose," red and white, 4 years 11 months-old (Jersey), in-milk and in-calf; bred by Mr. Aubin, St. Saviour's, Jersey.

THOMAS WILSON, Shotley Hall, Shotley Bridge, Gateshead, Northumberland: THIRD PRIZE, Silver Medal, for fawn and white, 8 years-old (Alderney), in-milk and in-calf; bred by Mr. Fowler.

RICHARD EASTWOOD, Thorney Holme, Clitheroe, Lancashire: the *Reserved Number*, to "Tit," fawn and white, 4 years-old (Channel Islands), in-milk; breeder unknown.

JAMES DUMBRELL, Ditchling, Hurstperpoint, Sussex: FIRST PRIZE, 10*l.*, for "Geranium," lemon and white, 2 years 5 months-old (Jersey,) in-calf; bred by exhibitor; sire, "Prince Peacock."

JAMES DUMBRELL: SECOND PRIZE, 5*l.*, for "Cowslip," lemon and white, 2 years 10 months-old (Jersey), in-calf; bred by exhibitor; sire, "Peacock;" dam, "Lemon."

Ayrshire Bulls.

JOHN STEWART, Burnside Cottage, Strathaven, Lanarkshire: FIRST PRIZE, 20*l.*, for "Defiance," white and brown, 2 years 2 months 3 weeks-old; bred by Matthew Gilmour, Gree, Berth, Ayrshire.

JOHN STEWART: SECOND PRIZE, 10*l.*, for "Marquis," white and dark brown, 2 years 2 months 2 weeks-old; bred by Robert M'Kean, Lumloch, Cadder, Lanarkshire; sire, "Sir Colin."

WILLIAM SCOTT, Cranberry, Ecclefechan, Dumfriesshire: FIRST PRIZE, 20*l.*, "Sir Walter Scott," white roan, 1 year 4 months-old; bred by exhibitor; sire, "Sir Colin 2nd;" dam, "Swanie;" sire of dam, "Jack."

THE DUKE OF HAMILTON AND BRANDON, Hamilton Palace, Hamilton, Lanarkshire: SECOND PRIZE, 10*l.*, for his white and red, 1 year 2 months-old; bred by exhibitor.

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THE DUKE OF HAMILTON AND BRANDON: the *Reserved Number*, to his red and white, 1 year 2 months-old; bred by Lawrence Drew, Merryton, Hamilton, Lanarkshire.

Ayrshire Cows and Heifers.

THE DUKE OF HAMILTON AND BRANDON: FIRST PRIZE, 15*l.*, for "Park," white and red, 3 years 1 month-old, in-calf; bred by Lawrence Drew, Merryton, Hamilton, Lanarkshire.

THE DUKE OF HAMILTON AND BRANDON: SECOND PRIZE, 5*l.*, for his black, 3 years 2 months-old, in-milk; breeder unknown.

THE DUKE OF HAMILTON AND BRANDON: the *Reserved Number*, to "Scott," red and white, 4 years 2 months-old, in-calf; bred by Lawrence Drew, Merryton, Hamilton, Lanarkshire.

THE DUKE OF HAMILTON AND BRANDON: FIRST PRIZE, 10*l.*, for "Castleton," red and white, 2 years-old, in-calf; bred by Lawrence Drew, Merryton, Hamilton.

THE DUKE OF HAMILTON AND BRANDON: SECOND PRIZE, 5*l.*, for "Rutherglen," white and red, 2 years 2 months-old, in-calf; bred by Lawrence Drew, Merryton, Hamilton.

JOHN STEWART, Burnside Cottage, Strathaven, Lanarkshire: the *Reserved Number*, to "Beauty," flecked, 2 years 2 months 2 weeks-old, in-calf; bred by James Logan, Stonyholme, Kilbirnie, Ayrshire.

THE DUKE OF HAMILTON AND BRANDON: FIRST PRIZE, 10*l.*, for "Castelton," white and red, 1 year 2 months-old; bred by exhibitor.

THE DUKE OF HAMILTON AND BRANDON: SECOND PRIZE, 5*l.*, for "Airblaes." white and red, 1 year 1 month-old; bred by exhibitor.

JOHN STEWART, Burnside Cottage, Strathaven, Lanarkshire: the *Reserved Number*, to "Broom," white with light brown, 1 year 2 months-old; bred by Robert Kerr, Broom, Mearns, Renfrewshire.

Scotch Polled Bulls—except Galloways.

ROBERT WALKER, Hillside House, Portlethen, Aberdeen: FIRST PRIZE, 20*l.*, for "Foxmaule" (305), black, 5 years 1 month 6 days old (Scotch polled); bred by exhibitor; sire, "Marquis," (212); dam, "Matilda Fox" (302); sire of dam, "Cupbearer" (59).

ALEXANDER PATERSON, Mulben, Blackhillock-by-Keith, Co. Elgin: SECOND PRIZE, 10*l.*, for "Prince of Wales," black, 4 years 4 months 3 weeks 5 days-old (Scotch polled); bred by George Brown, Watertown, Fochabers, Elgin; sire, "Prince Albert;" dam, "Kate."

WILLIAM M'COMBIE, Tillyfour, Aberdeen: FIRST PRIZE, 20*l.*, for his black, 1 year 5 months-old (Angus polled); bred by exhibitor; sire, "Black Prince;" dam, "Charlotte;" sire of dam, "Angus."

Scotch Polled Cows and Heifers—except Galloways.

WILLIAM M'COMBIE: FIRST PRIZE, 15*l.*, for his "Pride of Aberdeen," black, 8 years 5 months-old (Angus polled), in-milk; bred by exhibitor; sire, "Hanton;" dam, "Charlotte;" sire of dam, "Angus."

WILLIAM M'COMBIE: SECOND PRIZE, 5*l.*, for his "Charlotte," black, 13 years 5 months-old (Angus polled), in-milk; bred by exhibitor; sire, "Angus;" dam, "Lola Montes;" sire of dam, "Monarch."

William M'Combie: First Prize, 10*l.*, for his black, 2 years 5 months-old (Angus polled), in-calf; bred by exhibitor.

William M'Combie: Second Prize, 5*l.*, for his black, 2 years 5 months-old (Angus polled), in-calf; bred by the Trustees of the late Mr. Scott, Balwyllo, Brechin, Forfar.

William M'Combie: First Prize, 10*l.*, for his black, 1 year 4 months-old (Angus polled); bred by exhibitor.

William M'Combie: Second Prize, 5*l.*, for his black, 1 year 5 months-old (Aberdeen and Angus polled); bred by exhibitor.

Lord Kinnaird, Rossie Priory, Inchture, Perthshire, the *Reserved Number*, to "Binn's Delight," black, 1 year, 2 months 1 week 3 days-old (Polled Angus); bred by William Watson, Binns, Dundee; sire, "Hugh 2nd;" dam, "Binn's Blossom;" sire of dam, "President 2nd."

Scotch Horned Bulls.

The Duke of Athole, Blair Castle, Blair Athole, Perthshire: First Prize, 20*l.*, for his red, 3 years 2 months 2 weeks-old (West Highland); bred by the late Marquis of Breadalbane, Taymouth Castle, Aberfeldy, Perthshire.

Viscount Boyne, Brancepeth Castle, Durham: Second Prize, 10*l.*, for his cream, 4 years 2 months-old (West Highland); bred by exhibitor.

The Duke of Athole, Blair Castle, Blair Athole, Perthshire: First Prize, 20*l.*, for "Gille Dubh," black, 1 year 4 months 2 weeks 5 days-old (West Highland); bred by exhibitor; dam, "Dubh Chiar."

The Duke of Athole: Second Prize, 10*l.*, for "Oscar," brindled, 1 year 5 months 3 weeks 5 days-old (West Highland); bred by exhibitor.

Scotch Horned Cows and Heifers.

The Duke of Athole: First Prize, 15*l.*, for "Rosie," red, 7 years 4 months-old (West Highland), in-milk; bred by the late Marquis of Breadalbane, Taymouth Castle, Aberfeldy, Perthshire.

The Duke of Athole: Second Prize, 5*l.*, for "Emily," brindled, 6 years 1 month 1 week 4 days-old (West Highland), in-milk; bred by the late Marquis of Breadalbane, Taymouth Castle, Aberfeldy, Perthshire; dam, "Beauty."

William Potts, Crook, Rothbury, Northumberland: the *Reserved Number*, to his dun, 4 years 8 months-old, in-milk; breeder unknown.

Bulls of other Established Breeds.

Lord Sondes, Elmham Hall, Thetford, Norfolk: First Prize, 10*l.*, for "Rufus," red, 3 years 8 months-old (Norfolk polled); bred by T. W. George, Eaton, Norwich.

Sir Edward Kerrison, Bart., M.P., Brome Hall, Scole, Suffolk: Second Prize, 5*l.*, for "Eclipse," red, 3 years 4 months 4 days-old (Suffolk polled); bred by Samuel Wolton, Newbourn Hall, Woodbridge, Suffolk; sire, "Nonpareil;" dam, "Cossett."

Barnabas Collins, Hunston, Ixworth, Suffolk: First Prize, 10*l.*, for "Richard I.," red, 3 years 4 months 4 days-old (Suffolk); bred by exhibitor; sire, "Nelson;" dam, "Cherry."

Lord Sondes, Elmham Hall, Thetford, Norfolk: Second Prize, 5*l.*, for "Red Jacket 4th," red, 1 year 9 months-old (Norfolk polled); bred by James Nicholson, Grassenhall, Dereham, Norfolk.

Cows and Heifers of other Established Breeds.

LORD SONDES: FIRST PRIZE, 10*l*., for "Fillpail," red, 5 years-old (Norfolk polled), in-milk and in-calf; bred by John Davey, Necton, Shipdham, Norfolk.

LORD SONDES: SECOND PRIZE, 5*l*., for "Crocus," red, 7 years 1 month-old (Norfolk polled), in-milk and in-calf; bred by exhibitor.

SIR WILLOUGHBY JONES, Bart., Cranmer Hall, Fakenham, Norfolk: THIRD PRIZE, Silver Medal, for "Buttercup," red, 3 years 2 months 3 weeks 4 days-old (Norfolk red polled), in-calf; bred by Robert Thompson, Barningham, Thetford, Norfolk.

SIR EDWARD KERRISON, Bart., M.P., Brome Hall, Scole, Suffolk: the *Reserved Number*, to "Oakly," red, 8 years-old (Norfolk polled), in-milk and in-calf; breeder unknown.

LORD SONDES, Elmham Hall, Thetford: FIRST PRIZE, 10*l*., for "Cherry," red, 2 years 7 months-old (Norfolk polled), in-calf; bred by exhibitor.

SIR WILLOUGHBY JONES, Bart., Cranmer Hall, Fakenham: SECOND PRIZE, 5*l*., for "Sweetbriar," red, 2 years 3 months-old (Norfolk polled), in-calf; bred by exhibitor; sire, "Red Jacket;" dam, "Cherry."

LORD SONDES, Elmham Hall, Thetford: the *Reserved Number*, to "Pink." 2 years 6 months-old (Norfolk polled), in-calf; bred by exhibitor.

BARNABAS COLLINS, Hunston, Ixworth, Suffolk: FIRST PRIZE, 10*l*., for "Princess," blood red, 1 year 4 months 3 days-old (Suffolk); bred by exhibitor; sire, "Sammy;" dam, "Rose;" sire of dam, "Red Rover."

SIR WILLOUGHBY JONES, Bart., Cranmer Hall, Fakenham: SECOND PRIZE, 5*l*., for "Bijou," red, 1 year 1 month 1 week 3 days-old (Norfolk red polled); bred by Stephen Leeds, North Barsham, Fakenham, Norfolk.

LORD SONDES, Elmham Hall, Thetford: the *Reserved Number*, to "Bell," red, 1 year 8 months-old (Norfolk polled); bred by exhibitor.

HORSES.

Thorough-bred Stud Horses.

CHARLES and JAMES MOFFITT, Kirklington Park, Carlisle, Cumberland: FIRST PRIZE, 100*l*., for "Laughingstock," bay, 5 years-old; bred by Sir Charles Monck, Belsay Castle, Newcastle-on-Tyne; sire, "Stockwell;" dam, "Gaiety;" sire of dam, Touchstone."

EDWARD GEORGE SIMPSON, Levent Bridge, Yarm, Yorkshire: SECOND PRIZE, 25*l*., for "Cavendish," brown, 8 years-old; bred by William Robinson, Richmond, Yorkshire; sire, "Voltigeur;" dam, "Countess of Burlington;" sire of dam, "Touchstone."

SIR CHARLES M. L. MONCK, Belsay, Newcastle-on-Tyne: the *Reserved Number*, to "Gamester," bay, 8 years-old; bred by exhibitor; sire, "The Cossack;" dam, "Gaiety;" sire of dam, "Touchstone."

Hunter Stallions.

JOSEPH CASSON, Middleton Lodge, Uphall Edinburgh: FIRST PRIZE, 25*l*., for "Mottley," brown, 12 years-old; bred by Mr. Rickaby (address unknown); sire, "Touchstone;" dam, "Lanercost Mare;" sire of dam, "Lanercost."

Hunter Brood Mares.

JOHN BROWN, Wiggonby, Wigton, Cumberland: FIRST PRIZE, 15*l.*, for "Sally," bay, 12 years-old (with foal at foot); bred by Mr. Chambers, Pelutho, Wigton; sire, "Galaor;" dam, "Madame;" sire of dam, "Retriever."

WILLIAM T. SCARTH, Keverstone Grange, Darlington: SECOND PRIZE, 10*l.*, for "Plucky," brown, 19 years-old (with foal at foot); bred by Mr. Ran, Piercebridge, Darlington; sire, "Nimrod;" sire of dam, "Curtius."

CHARLES MOFFATT, Crosby-on-Eden, Carlisle: the *Reserved Number*, to his brown, 13 years-old (in foal); bred by John Chambers, Pelutho, Abbey Holme, Cumberland; sire, "Galaor;" sire of dam, "Retriever."

Hackney Brood Mares.

RICHARD BRITTON, Leeds Pottery, Leeds: FIRST PRIZE, 15*l.*, for "Fanny," black, 12 years-old (with foal at foot); breeder unknown.

FRANCIS COOK, Thixendale, Malton, Yorkshire: SECOND PRIZE, 10*l.*, for "The British Queen," bay, 6 years-old (in foal); bred by exhibitor; sire, "British Champion;" dam, "Evening Star;" sire of dam, "Cook's Wildfire."

Pony Stallions.

ROBERT NORMAN and SON, High Close, Aspatria, Cumberland: FIRST PRIZE, 15*l.*, for "Jack," chesnut, 4 years-old; bred by exhibitors; sire, "Potentate;" dam, "Jessie."

WILLIAM and STEPHEN HODGSON, Rodderup, Penrith Alstan, Cumberland: SECOND PRIZE, 5*l.*, for "Glengarry," dark bay, 9 years-old; bred by Mr. Graham, Bald Howe, Matterdale, Cumberland; sire, "Mountain Ranger."

Pony Mares.

GEORGE HEPPEL RAMSAY, Derwent Villa, Newcastle: FIRST PRIZE, 10*l.*, for "Beauty ," grey, 8 years-old; bred by the Rev. Mr. Bird, Challerton, Hexham, Northumberland.

GEORGE HEPPEL RAMSAY: SECOND PRIZE, 5*l.*, for "My Lady," grey, 6 years-old; breeder unknown.

Agricultural Stallions not qualified to compete as Suffolks or Clydesdales.

SAMUEL STRICKLAND, Headley Hall, Tadcaster, Yorkshire: FIRST PRIZE, 20*l.*, for "Lincolnshire," brown, 6 years-old; breeder unknown; sire, "Young Waxwork;" sire of dam, "Ploughboy."

MATTHEW REED, Tanfield Burn, Chester-le-Street, Durham: SECOND PRIZE, 10*l.*, for "England's Glory," bay, 8 years-old; bred by W. Pank, Borough Fen, Northamptonshire; sire, "England's Glory;" dam, "Sweep;" sire of dam, "Thumper."

ROBERT ORANGE, Bedlington, Northumberland: THIRD PRIZE, Silver Medal, for "Conqueror," grey, 3 years-old; bred by Mr. Lilburn, Preston, North Shields; sire, "Young Conqueror;" sire of dam, "Industry."

THOMAS and SAMUEL FYSON, Warboys, Hunts.: the *Reserved Number*, to "Young England's Glory," bay, 4 years-old; bred by exhibitors; sire, "England's Glory;" dam, "Lightsome."

SAMUEL STRICKLAND, Headley Hall, Tadcaster, Yorkshire: **FIRST PRIZE, 15*l*.,** for "General Garibaldi," roan chesnut, 2 years-old; bred by exhibitor; sire, "Sampson;" dam, "Blossom;" sire of dam, "Great Britton."

JOHN HENDERSON, Hossley Hill, South Shields: SECOND PRIZE, 10*l*., for "Victor," bay, 2 years-old; bred by exhibitor; sire, "England's Glory;" dam, "Damsel;" sire of dam, "Farmer's Glory."

THOMAS IRWIN, High Spen, Winlaton, Durham: the *Reserved Number*, to "Emulator," dark bay, 2 years-old; bred by William Johnson, Danial, Ryton, Durham; sire, "Young Sampson."

Agricultural Mares and Foals not qualified to compete as Suffolks or Clydesdales.

JOHN B. DIXON, Hollings Farm, Ebchester, Northumberland: **FIRST PRIZE,** 20*l*., for "Jolly," dark brown, 18 years-old; bred by John Dixon, Broad Oak, Ebchester; sire, "Nelson Ball;" dam, "Blossom;" sire of dam, "Raven."

SAMUEL THOMPSON, Peel Hall Farm, Skipworth, Selby, Yorkshire: SECOND PRIZE, 10*l*., for "Diamond," black, 5 years-old; bred by exhibitor; sire, "Black Douglas;" dam, "Darby;" sire of dam, "Little John."

JONATHAN M. PATTISON, Norwood, Gateshead: the *Reserved Number*, to "Jolly," bay, 4 years-old; bred by exhibitor; sire, "England's Glory;" dam, "Jolly;" sire of dam, "Wallace."

Agricultural Fillies not qualified to compete as Suffolks or Clydesdales.

JOHN EDEN, Beamish Park, Fence Houses, Durham: **FIRST PRIZE, 15*l*.,** for "Beauty," bay, 2 years-old; bred by exhibitor; sire, "England's Glory;" dam, "Damsel;" sire of dam, "Wallace."

MATTHEW REED, Beamish Burn, Chester-le-Street, Durham: **FIRST PRIZE,** 15*l*., for "George 2nd," grey, 14 years-old; bred by Mr. Dodd, Byfield, Northampton; sire, "Brown George."

Dray Stallions.

WILLIAM DICKMAN, Lumley, Fence Houses, Durham: **FIRST PRIZE, 20*l*.,** for "Young England," grey, 2 years-old; bred by exhibitor; sire, "England's Glory;" dam, "Nonpareil."

Dray Mares and Foals.

WILLIAM DICKMAN: FIRST PRIZE, 15*l*., for his grey, 6 years-old; bred by exhibitor; sire, "Nonpareil."

Suffolk Stallions.

EDMUND COTTINGHAM, Dunningworth Hall, Saxmundham, Suffolk: **FIRST** PRIZE, 20*l*., for "Talbot," chesnut, 4 years-old; bred by J. G. Sheppard, Campsey Ashe, Wickham Market, Suffolk; sire, "Capon's Duke;" dam, "Doughty;" sire of dam, "Ajax."

CHARLES BOBY, Alton Hall, Stutton, Ipswich: SECOND PRIZE, 10*l*., for "Conqueror," chesnut, 5 years-old; bred by exhibitor; sire, "Hero;" sire of dam, "Old Briton."

[illegible] GILES, Croxton Park, Thetford, Norfolk: FIRST PRIZE, 15*l*., for "Ploughboy," chesnut, 2 years-old; bred by exhibitor; sire, "Boxer;" dam, "[illegible];" sire of dam, "Prince."

WILLIAM THOMPSON, junr., Rose Cottage, Thorpe, Colchester, Essex: SECOND PRIZE, 10*l.*, for "Garibaldi," chesnut, 2 years-old; bred by exhibitor; dam, "Brock."

Suffolk Mares and Foals.

SIR T. B. LENNARD, Bart., Belhus, Aveley, Romford, Essex: FIRST PRIZE, 20*l.*, for "Canterbury Nun," chesnut, 6 years-old; bred by Mr. Buck, Creetingham, Wickham Market, Suffolk; sire, "The Hero;" sire of dam, "Captain."

SIR EDWARD KERRISON, Bart., M.P., Brome Hall, Scole, Suffolk: SECOND PRIZE, 10*l.*, for "Lady Jane," chesnut, 5 years-old; breeder unknown.

Clydesdale Stallions.

ANTHONY GRIERSON, Kelhead, Annan, Dumfriesshire: FIRST PRIZE, 20*l.*, for "The Benecia Boy," bay, 5 years-old; bred by Robert Lochead, Glenshinnoch, Bishopton, Paisley, Renfrewshire; sire, "Young Sampson;" sire of dam, "Prince Royal."

DAVID RIDDLE, Kilhourie, Duntocher, Dumbartonshire: FIRST PRIZE, 15*l.*, for "Young Sir Walter Scott," dark bay, 2 years-old; bred by William Moffat, Shirna, Kirkintilloch, Dumbartonshire; sire, "Sir Walter Scott;" dam, "Jessie."

ROBERT MOFFAT, Dormansteads, Stapleton, Brampton, Cumberland: SECOND PRIZE, 10*l.*, for "Clyde," brown, 2 years-old; bred by Messrs. Bell, Nook Erthington, Brampton, Cumberland; sire, "Lofty;" sire of dam, "Young Clyde."

Clydesdale Mares and Foals.

JAMES MARR, Alderstone, Mid Calder, Midlothian: FIRST PRIZE, 20*l.*, for "Jess," brown, 7 years-old; breeder unknown.

JOHN MUIR, Lockfergus, Kirkcudbright: SECOND PRIZE, 10*l.*, for "Rosy," grey, 7 years-old; bred by Mr. Pattie, Dalriskan, Dumfries; sire, "Lord Byron;" dam, "Rosy."

Clydesdale Fillies.

THE DUKE OF HAMILTON AND BRANDON, Hamilton Palace, Hamilton, Lanarkshire: FIRST PRIZE, 15*l.*, for his bay, 2 years-old; bred by John Barr, Barangray, Bishoptown, Renfrewshire; sire, "Garibaldi;" dam, "Darling."

SHEEP.

Leicester Rams.

JOHN BORTON, Barton House, Malton, Yorkshire: FIRST PRIZE, 20*l.*, for his 1 year 3 months-old; bred by exhibitor.

THOMAS EDWARD PAWLETT, Beeston, Sandy, Beds: SECOND PRIZE, 10*l.*, for his 1 year 3 months-old; bred by exhibitor.

LIEUTENANT-COLONEL WILLIAM INGE, Thorpe Constantine, Tamworth, Staffordshire: THIRD PRIZE, Silver Medal, for his 1 year 4 months-old; bred by exhibitor; sire, "C. N."

JOHN BORTON, Barton House, Malton, Yorkshire: the *Reserved Number*, to his 1 year 3 months-old; bred by exhibitor.

ROBERT WARD CRESWELL, Ravenstone, Ashby-de-la-Zouch, Leicestershire: FIRST PRIZE, 20*l.*, for his 3 years 4 months-old; bred by exhibitor.

ROBERT WARD CRESWELL, SECOND PRIZE, 10*l.*, for his 3 years 4 months-old; bred by exhibitor.

GEORGE TURNER, Beacon Downes, Exeter, Devonshire: THIRD PRIZE, Silver Medal, for his 3 years 4 months-old; bred by exhibitor.

GEORGE TURNER, the *Reserved Number*, to his 2 years 4 months-old; bred by exhibitor.

Leicester Ewes—Pens of Five.

SAMUEL WILEY, Brandsby, York: FIRST PRIZE, 15*l.*, for his about 1 year 3 months-old; bred by exhibitor.

LIEUTENANT-COLONEL WILLIAM INGE, Thorpe Constantine, Tamworth: SECOND PRIZE, 10*l.*, for his 1 year 4 months-old; bred by exhibitor; sire, "C. N."

THOMAS MARRIS, The Chase, Ulceby, Lincolnshire: the *Reserved Number*, to his 1 year 3 months 2 weeks-old; bred by exhibitor.

Cotswold Rams.

EDWARD HANDY, Sierford, Cheltenham, Gloucestershire: FIRST PRIZE, 20*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

JOHN WELLS, Hampnett, Northleach, Gloucestershire: SECOND PRIZE, 10*l.*, for his 1 year 3 months 3 weeks-old; bred by exhibitor.

EDWARD HANDY, Sierford, Cheltenham: THIRD PRIZE, Silver Medal, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

WILLIAM LANE, Bromfield Farm, Northleach, the *Reserved Number*, to his 1 year 3 months 2 weeks-old; bred by exhibitor.

THOMAS BEALE BROWNE, Salperton Park, Andoversford, Gloucestershire: FIRST PRIZE, 20*l.*, for his 4 years 3 months-old; bred by exhibitor.

WILLIAM LANE, Bromfield Farm, Northleach: SECOND PRIZE, 10*l.*, for his 3 years 4 months-old; bred by exhibitor.

THOMAS BEALE BROWNE, Salperton Park, Andoversford: THIRD PRIZE, Silver Medal, for his 3 years 3 months-old; bred by exhibitor.

WILLIAM LANE, Bromfield Farm, Northleach: the *Reserved Number*, to his 3 years 3 months-old; bred by exhibitor.

Cotswold Ewes—Pens of Five.

JOHN WELLS, Hampnett, Northleach: FIRST PRIZE, 15*l.*, for his 1 year 3 months 2 weeks old; bred by exhibitor.

WILLIAM LANE, Bromfield Farm, Northleach: SECOND PRIZE, 10*l.*, for his 1 year 3 months-old; bred by exhibitor.

W[illegible]IAM LANE, the *Reserved Number*, to his 1 year 3 months-old; bred by exhibitor.

Lincoln and other Long-woolled Rams.

[illegible]RT WRIGHT, Nocton Heath, Nocton, Lincolnshire: FIRST PRIZE, 20*l.*, for his 1 year 3 months 3 weeks-old; bred by exhibitor.

[illegible]ERT WRIGHT: SECOND PRIZE, 10*l.*, for his 1 year 3 months 3 weeks-old; bred by exhibitor.

John Lynn, Church Farm, Stroxton, Grantham, Lincolnshire: Third Prize, Silver Medal, for his 1 year 4 months-old; bred by exhibitor; sire, "Battersea Royal."

Thomas Bumpstead Marshall, Branston, Lincoln: the *Reserved Number* to his 1 year 4 months-old; bred by exhibitor.

Thomas Bumpstead Marshall: First Prize, 20*l.*, for his 4 years 4 months-old; bred by exhibitor.

Thomas Bumpstead Marshall: Second Prize, 10*l.*, for his 2 years 4 months-old; bred by exhibitor.

Robert Wright, Nocton Heath, Nocton, Lincolnshire: the *Reserved Number*, to his 3 years 3 months-old; bred by John Dixon, Harmston, Lincolnshire.

Lincoln and other Long-woolled Ewes—Pens of Five.

Robert George Frederick Howard, Temple Bruer, Lincoln: First Prize, 15*l.*, for his 1 year 4 months-old; bred by exhibitor.

Thomas Bumpstead Marshall, Branston, Lincoln: Second Prize, 10*l.*, for his 1 year 4 months-old; bred by exhibitor.

Robert George Frederick Howard, Temple Bruer, Lincoln; the *Reserved Number*, to his 1 year 4 months-old; bred by exhibitor.

Oxfordshire Down Rams.

George Wallis, Old Shifford, Bampton, Faringdon, Oxfordshire: First Prize, 20*l.*, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

George Wallis: Second Prize, 10*l.*, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

George Wallis: Third Prize, Silver Medal, for his 1 year 5 months 2 weeks-old; bred by exhibitor.

John Bryan, Southleigh, Witney, Oxfordshire: the *Reserved Number*, to his 1 year 4 months-old; bred by exhibitor.

George Wallis: First Prize, 20*l.*, for his 3 years 5 months 2 weeks-old; bred by exhibitor.

George Wallis: Second Prize, 10*l.*, for his 2 years 5 months, 2 weeks-old; bred by exhibitor.

George Wallis: the *Reserved Number*, to his 3 years 5 months 2 weeks-old; bred by exhibitor.

Oxfordshire Down Ewes—Pens of Five.

Henry Overman, Weasenham, Rougham, Norfolk, First Prize, 15*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

The Duke of Marlborough, Blenheim Palace, Woodstock, Oxfordshire: Second Prize, 10*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

The Executors of the late Samuel Treadwell, Upper Winchendon, Waddesdon, Aylesbury, Buckinghamshire: the *Reserved Number*, to their about 1 year 5 months-old; bred by exhibitors.

South Down Rams.

Lord Walsingham, Merton Hall, Thetford, Norfolk: First Prize, 20*l.*, for his 1 year 4 months-old; bred by exhibitor.

Lord Walsingham: Second Prize, 10*l.*, for his 1 year 4 months-old; bred by exhibitor.

WILLIAM RIGDEN, Hove, Brighton: THIRD PRIZE, Silver Medal, for his 1 year 4 months-old; bred by exhibitor.

LORD WALSINGHAM: the *Reserved Number*, to his 1 year 4 months-old; bred by exhibitor.

JOHN WATERS, Motcomb, Eastbourne, Sussex: FIRST PRIZE, 20*l.*, for his 2 years 3 months 2 weeks-old; bred by exhibitor.

WILLIAM RIGDEN, Hove, Brighton: SECOND PRIZE, 10*l.*, for his 2 years 4 months-old; bred by exhibitor.

THE DUKE OF RICHMOND, Goodwood, Chichester, Sussex: THIRD PRIZE, Silver Medal, for his 2 years 4 months-old; bred by exhibitor.

THE EARL OF RADNOR, Coleshill House, Highworth, Wilts: the *Reserved Number*, to his 2 years 4 months-old; bred by exhibitor; sire, "Coleshill."

South-Down Ewes—Pens of Five.

LORD WALSINGHAM, Merton Hall, Thetford, Norfolk: FIRST PRIZE, 15*l.*, for his 1 year 4 months-old; bred by exhibitor.

THE DUKE OF RICHMOND, Goodwood, Chichester, Sussex: SECOND PRIZE, 10*l.*, for his 1 year 4 months old; bred by exhibitor.

THE EARL OF RADNOR, Coleshill House, Highworth: the *Reserved Number*, to his 1 year 4 months-old; bred by exhibitor; sire, "Battersea," dam, "Rigden's No. 5, 1862."

Shropshire Rams.

EDWARD THORNTON, Pitchford, Shrewsbury, Shropshire: FIRST PRIZE, 20*l.*, for his 1 year 3 months 1 week-old; bred by exhibitor; sire, "Thornton," sire of dam, "Park Lord."

HENRY MATTHEWS, Montford, Shrewsbury: SECOND PRIZE, 10*l.*, for his "Montford," 1 year 3 months 2 weeks-old; bred by exhibitor.

JOHN COXON, Freeford, Lichfield, Staffordshire: THIRD PRIZE, Silver Medal, for his "Novelty," 1 year 3 months 2 weeks-old; bred by exhibitor; sire, "Nobleman."

SAMPSON BYRD, The Lees Farm, Stafford: the *Reserved Number*, to his "Patentee 5th," 1 year 3 months 2 weeks-old; bred by exhibitor; sire, "Constitution;" sire of dam, "Patentee."

JOHN COXON, Freeford, Lichfield, Staffordshire: FIRST PRIZE, 20*l.*, for his "Black Knight," 2 years 3 months 2 weeks-old; bred by exhibitor; sire, "Valiant the 2nd," sire of dam, "Lord Flash."

'RYCE WILLIAM BOWEN, Shrawardine Castle, Shrewsbury: SECOND PRIZE, 10*l.*, for his 2 years 3 months 2 weeks-old; bred by exhibitor.

JOSEPH SIMPSON, Spofforth Park, Wetherby, Yorkshire: the *Reserved Number*, o his 4 years 3 months 2 weeks-old; bred by Lord Wenlock.

Shropshire Ewes—Pens of Five.

HENRY MATTHEWS, Montford, Shrewsbury: FIRST PRIZE, 15*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

HENRY SMITH, Sutton Maddock, Shiffnal, Shropshire: SECOND PRIZE, 10*l.*, for his 1 year 4 months 1 week-old; bred by exhibitor.

EDWARD HOLLAND, Esq., M.P., Dumbleton Hall, Evesham, Gloucestershire: THIRD PRIZE Silver Medal, for his 1 year 4 months-old; bred by exhibitor

JAMES and EDWARD CRANE, Shrawardine, Shrewsbury: the *Reserved Number*, to their 1 year 3 months 1 week-old; bred by exhibitors; sire, "Celebrity the 2nd;" sire of dam, "Juckes."

Hampshire and other Short-woolled Rams.

WILLIAM BROWNE CANNING, Elston Hill, Devizes, Wiltshire: FIRST PRIZE, 20*l.*, for his 1 year 4 months 3 weeks-old; bred by exhibitor.

STEPHEN KING, Bockhampton, Lambourne, Berkshire: SECOND PRIZE, 10*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

STEPHEN KING: the *Reserved Number* to his 1 year 4 months 2 weeks-old; bred by exhibitor.

WILLIAM HUMFREY, Oak Ash, Chaddleworth, Wantage, Berkshire: FIRST PRIZE, 20*l.*, for his 2 years 5 months 2 weeks-old; bred by exhibitor.

CHRISTOPHER ROSE, Zeals Green, Mere, Wiltshire: SECOND PRIZE, 10*l.*, for his 2 years 4 months 2 weeks 6 days-old; bred by Mr. Waters, Stratford Subcastle, Salisbury, Wiltshire.

WILLIAM HUMFREY, Oak Ash, Chaddleworth, Wantage: the *Reserved Number* to his 2 years 5 months 1 week-old; bred by exhibitor.

Hampshire and other Short-woolled Ewes—Pens of Five.

WILLIAM BROWNE CANNING, Elston Hill, Devizes, Wiltshire: FIRST PRIZE, 15*l.*, for his 1 year 4 months 2 weeks-old; bred by exhibitor.

WILLIAM HUMFREY, Oak Ash, Chaddleworth, Wantage: SECOND PRIZE, 10*l.*, for his 1 year 5 months-old; bred by exhibitor.

STEPHEN KING, Bockhampton, Lambourne: the *Reserved Number*, to his 1 year 4 months 2 weeks-old; bred by exhibitor.

Cheviot Rams.

THOMAS ELLIOT, Hindhope, Jedburgh, Roxburghshire: FIRST PRIZE, 15*l.*, for his 1 year 2 months 3 weeks-old; bred by exhibitor.

JOHN MCGREGOR, Riggheads, Lochmaben, Dumfries: SECOND PRIZE, 5*l.*, for his "Garibaldi," 1 year 2 months 3 weeks-old; bred by exhibitor; sire, "Hector;" sire of dam, "Robinson."

ROBERT BORLAND, Auchincairn, Thornhill, Dumfries: THIRD PRIZE, Silver Medal, for his 1 year 3 months-old; bred by exhibitor; sire, "Perth;" sire of dam, "Robson."

JAMES PATERSON, Terrona, Langholm, Dumfriesshire: the *Reserved Number*, to "Conservator," 1 year 2 months 2 weeks-old; sire, "Thirlie."

JOHN ROBSON, Byness, Rochester, Northumberland: FIRST PRIZE, 15*l.*, for "Nully," 2 years 3 months old; bred by exhibitor; sire, "Andrew."

JOHN ROBSON: SECOND PRIZE, 5*l.*, for "Johnny," 2 years 3 months-old; bred by exhibitor; sire, "Andrew."

JOHN ROBSON: the *Reserved Number*, to "Caffy," 2 years 3 months-old; bred by exhibitor; sire, "Andrew."

Cheviot Ewes—Pens of Five.

ROBERT BORLAND, Auchincairn, Thornhill, Dumfries: FIRST PRIZE, 10*l.*, for his 1 year 3 months-old; bred by exhibitor; sire, "Perth;" sire of dam, "Robson."

THOMAS ELLIOT, Hindhope, Jedburgh, Roxburghshire: SECOND PRIZE, 5*l.*, for his 1 year 2 months 2 weeks-old; bred by exhibitor.

ROBERT SHORTREED, Attonburn, Kelso, Roxburghshire: the *Reserved Number*, to his 1 year 2 months 2 weeks-old; bred by exhibitor.

Blackfaced Rams.

WILLIAM WARD, Forest Hall, Kendal, Westmoreland: FIRST PRIZE, 15*l.*, for his 1 year 2 months 2 weeks-old; bred by exhibitor.

HENRY WALTON, Appletree Shield, West Allen, by Haydon Bridge, Northumberland: SECOND PRIZE, 5*l.*, for "the Bloom of the Hather," 1 year 2 months 2 weeks 6 days-old; bred by Mr. White, Westburnhope, Hexhamshire, Northumberland; sire, "The Pride of the Hather;" sire of dam, "The King of the Mountain."

ALEXANDER WEARING LONG, Mint Cottage, Kendal, Westmoreland: the *Reserved Number*, to his 1 year 3 months-old; bred by exhibitor.

WILLIAM WARD, Forest Hall, Kendal: FIRST PRIZE, 15*l.*, for his "Geordie," 5 years 2 months 2 weeks-old; bred by George Hudson, Longsledale, Kendal, Westmoreland.

GEORGE HEDLEY, Otterstone Lee, Bellingham, Northumberland: SECOND PRIZE, 5*l.*, for his "Sultan," 5 years 3 months-old; bred by John Roddam, of Newfold House, Allendale Town, Durham.

CHARLES SUMMERS, Whitfield, Haydon Bridge, Northumberland: the *Reserved Number* to his "Jock," 3 years 3 months-old; bred by Mathew White, Westburnhope, Hexham, Northumberland.

Blackfaced Ewes—Pens of Five.

CHRISTOPHER ARMSTRONG, Ashgillside, Alston, Cumberland: FIRST PRIZE, 10*l.*, for his 1 year 3 months-old; bred by exhibitor.

JOHN AND WILLIAM DODD, Padaburn, Rosehill, Northumberland: SECOND PRIZE, 5*l.*, for their 1 year 2 months 5 days-old; bred by exhibitors; sire, "Scottish Chief."

WILLIAM WARD, Forest Hall, Kendal, Westmoreland: the *Reserved Number*, to his 1 year 2 months 2 weeks-old; bred by exhibitor.

PIGS.

Boars of a Large White Breed.

HENRY HARRISON, Cross Hills, Leeds, Yorkshire: FIRST PRIZE, 10*l.*, for "Young Hero," 1 year 10 months-old; bred by exhibitor; dam, "Lilydale."

RICHARD ELMHURST DUCKERING, Northorpe, Kirton Lindsey, Lincolnshire: SECOND PRIZE, 5*l.*, for "Victor," 2 years 10 months 3 weeks 4 days-old; bred by John Harrison, Jun., Heaton Norris, Stockport, Lancashire; sire, "Albert the 2nd or Samsom;" dam, "Betsey."

JOHN HICKMAN, 21, Prospect-street, Hull, Yorkshire: the *Reserved Number*, to "Duke of York," about 2 years 10 months-old; bred by R. Earl, Birmingham.

Boars of a Small White Breed.

GEORGE MANGLES, Givendale, Ripon, Yorkshire: FIRST PRIZE, 10*l.*, for "Brutus," 2 years 6 months 3 weeks-old (Yorkshire and Cumberland); bred by exhibitor; sire, "King of Diamonds;" dam, "Princess;" sire of dam, "Samuel."

THOMAS DUNLOP FINDLAY, Easterhill, Glasgow: SECOND PRIZE, 5*l.*, for "George I.," 2 years 8 months-old; bred by exhibitor; sire, "His Lordship;" dam, "Kate."

SAMUEL GRATER STEARN, Brandeston, Wickham Market, Suffolk: THIRD PRIZE, Silver Medal, for "Young Duke," 10 months 1 week 2 days-old (Suffolk), bred by exhibitor; sire, "Prince of Wales;" dam, "Victoria 2nd;" sire of dam, "Marquis."

WILLIAM PARKER, Golden Lion Inn, Leeds Road, Bradford, Yorkshire: the *Reserved Number*, to "Figaro," 1 year 6 months 2 weeks 4 days-old; bred by exhibitor.

Boars of a Small Black Breed.

GEORGE MUMFORD SEXTON, Wherstead Hall, Ipswich, Suffolk: FIRST PRIZE, 10*l.*, for "General Peel," 1 year 2 months 2 weeks 3 days-old (Suffolk); bred by exhibitor; sire, "Battersea Prince;" dam, "Bumptious 2nd;" sire of dam, "Terror."

GEORGE MUMFORD SEXTON: SECOND PRIZE, 5*l.*, for "Blair Athol," 1 year 1 month 2 weeks 3 days-old (Suffolk); bred by exhibitor; sire, "Battersea Prince;" dam, "Charmer;" sire of dam, "Shortnose."

LORD WENLOCK, Escrick Park, Yorkshire: the *Reserved Number*, to "Cannon Ball 2nd," 11 months-old; bred by exhibitor; sire, "Cannon Ball 1st."

Boars of the Berkshire Breed.

The REV. HENRY G. BAILY, Swindon, Wilts.: FIRST PRIZE, 10*l.*, for his black, with a little white, 1 year 3 months 3 weeks 2 days-old; bred by exhibitor; sire, "Hannibal;" dam, "Empress;" sire of dam, "King of Gloucester."

The REV. HENRY G. BAILY, SECOND PRIZE, 5*l.*, for "Governor," black, with a little white, 1 year 1 day-old; bred by exhibitor; sire, "Thomas Hogg," dam, "Rival Princess;" sire of dam, "King of Warwick."

ARTHUR STEWART, Saint Bridge, Gloucester: THIRD PRIZE, Silver Medal, for "Garibaldi," black, 7 months 1 week-old; bred by exhibitor; sire, "John."

GEORGE MANDER ALLENDER, Lee Grange, Winslow, Buckinghamshire: the *Reserved Number*, to "Brummagem Lad," black, 1 year 1 month-old; bred by exhibitor; sire, "Sir John;" dam, "Darkie."

Boars of any other Breed.

WILLIAM BRADLEY WAINMAN, Carhead, Cross Hills, Yorkshire: FIRST PRIZE, 10*l.*, for "Perfect Cure," white, 2 years 2 months-old (middle); bred by J. Palmer, of Skipton, Yorkshire; sire, "King Cube."

CHARLES WILLIAM GRAHAM, 1, Blackburn's Buildings, York-road, Leeds, Yorkshire: SECOND PRIZE, 5*l.*, for "Pride of Leeds," white, about 3 years-old (middle); bred by Mr. Rinder, of Sheepscar, Leeds; sire, "Cupid."

WILLIAM BRADLEY WAINMAN, Carhead, Cross Hills, Yorkshire: the *Reserved Number*, to "Bend Sinister," about 3 years-old (middle); breeder unknown.

Breeding Sows of a Large White Breed.

WILLIAM BRADLEY WAINMAN: FIRST PRIZE, 10*l.*, for "Rival Duchess," 3 years 4 days-old; bred by exhibitor.

WILLIAM BRADLEY WAINMAN: SECOND PRIZE, 5*l.*, for "Rival Hope," 2 years 10 months-old; breeder unknown.

JOHN HICKMAN, 21, Prospect-street, Hull: THIRD PRIZE, Silver Medal, for "Young Princess," 2 years 3 months 2 weeks-old; bred by exhibitor; sire, "Tom Pinch;" dam, "Princess;" sire of dam, "Old Duke."

STEPHEN BLAKEY, Westgate, Otley, Yorkshire: the *Reserved Number*, to "Lady Fitzwilliam," 2 years 6 months 2 weeks-old; bred by John Hartley, of Ilkley, Otley, Yorkshire; sire, "Wharfdale Hero;" dam, "Miller's Lass;" sire of dam, "Young Hector."

Breeding Sows of a Small White Breed.

WILLIAM BRADLEY WAINMAN, Carhead, Cross Hills, Yorkshire: FIRST PRIZE, 10*l.*, for "Silver Branch," 2 years 4 months 2 weeks-old; bred by Sir Charles R. Tempest, Bart., Broughton Hall, Skipton, Yorkshire; sire, "Carhead Oberon;" dam, "The Broughton Sow;" sire of dam, "Carhead Checkmate."

SAMUEL GEATER STEARN, Brandeston, Wickham Market, Suffolk: SECOND PRIZE, 5*l.*, for "Victoria 2nd," 2 years 2 months 3 weeks 2 days-old (Suffolk); bred by exhibitor; sire, "Marquis;" dam, "Victoria 1st;" sire of dam, "Duke."

THOMAS DUNLOP FINDLAY, Easter Hill, Glasgow: THIRD PRIZE, Silver Medal, for "Lady Emily," 1 year 4 months-old; bred by exhibitor; sire, "George the 1st;" dam, "Beauty."

WILLIAM HATTON, Addingham, Leeds: the *Reserved Number*, to "Young Reine de Flora," 1 year 1 month 2 weeks-old; bred by T. B. Stead, Leeds; sire, "Sir Colin;" dam, "Queen of the West."

Breeding Sows of a Small Black Breed.

GEORGE MUMFORD SEXTON, Wherstead Hall, Ipswich, Suffolk: FIRST PRIZE, 10*l.*, for "Breeze," 1 year 2 months 2 weeks 3 days-old (Suffolk); bred by exhibitor; sire, "Battersea Prince;" dam, "Bumptious;" sire of dam, "Terror."

SAMUEL GEATER STEARN, Brandeston, Wickham-Market, Suffolk: SECOND PRIZE, 5*l.*, for "Queen of Oude," 1 year 2 months 2 weeks 3 days-old (Suffolk); bred by exhibitor; sire, "Budd's Boar;" dam, "Gipsy Queen;" sire of dam, "Negro."

SAMUEL GEATER STEARN; THIRD PRIZE, Silver Medal, for "Aunt Chloe," 1 year 2 months 2 weeks 3 days-old (Suffolk); bred by exhibitor; sire, "Budd's Boar;" dam, "Gipsy Queen;" sire of dam, "Negro."

THOMAS CRISP, Butley Abbey, Wickham-Market: the *Reserved Number*, to his 1 year 11 months 1 week 5 days-old (Improved Suffolk); bred by exhibitor

Breeding Sows of the Berkshire Breed.

ARTHUR STEWART, St. Bridge, Gloucester: FIRST PRIZE, 10*l.*, for "Dido," black, 1 year 2 months 1 week 1 day-old; bred by exhibitor; sire, "Tim Whiffler;" dam, "Aunt Sally;" sire of dam, "Tim the Blacksmith."

ARTHUR STEWART: SECOND PRIZE, 5*l.*, for "Mrs. Gamp," black; bred by exhibitor; sire, "Edward;" dam, "Lady Louisa;" sire of dam, "Duke of Gloucester."

GEORGE MANDER ALLENDER, Lee Grange, Winslow, Bucks: THIRD PRIZE, Silver Medal, for "Topsy," black, 1 year 10 months 5 days-old; bred by exhibitor; sire, "Glo'ster;" dam, "Darkie."

JOHN LYNCH FLETCHER, the Royal Agricultural College, Cirencester, Gloucestershire: the *Reserved Number*, to "Selina," black, with little white, 1 year 2 months 1 week 6 days-old; bred by R. A. College, Cirencester; sire, "Duke of Gloucester;" dam, "Stumpy."

Breeding Sows of any other Breed.

WILLIAM BRADLEY WAINMAN, Carhead, Cross Hills, Yorkshire: FIRST PRIZE, 10*l.*, for "Northern Garland," white, 2 years 7 months 3 weeks 1 day-old (Carhead middle).

WILLIAM BRADLEY WAINMAN: SECOND PRIZE, 5*l.*, for "The Happy Link," white, 2 years 7 months 1 week 6 days-old (Carhead middle); bred by exhibitor.

HENRY KEYWORTH, Woodhouse Moor, Leeds: THIRD PRIZE, Silver Medal, for "Dewdrop," white, 1 year 5 months 3 weeks-old (middle); bred by exhibitor; sire, "Pride of Leeds;" dam, "Lily of the Valley;" sire of dam, "Young Omer Pasha."

CHARLES WILLIAM GRAHAM, 1, Blackburn's Buildings, York Road, Leeds: the *Reserved Number*, to "Rose of the Valley," 2 year-old (middle); bred by William Howe, Union-street, Huddersfield, Yorkshire.

Breeding Sow Pigs of a Large White Breed—Pens of Three.

WILLIAM BRADLEY WAINMAN, Carhead, Cross Hills, Yorkshire: FIRST PRIZE, 10*l.*, for his white, 7 months 3 weeks 3 days-old (Carhead); bred by exhibitor.

JOHN HICKMAN, 21, Prospect-street, Hull: SECOND PRIZE, 5*l.*, for his white with blue spots, 7 months 3 days-old; bred by exhibitor; sire, "Garibaldi;" dam, "Young Princess;" sire of dam, "Tom Pinch."

RICHARD ELMSHIRST DUCKERING, Northorpe, Kirton Lindsey, Lincolnshire: the *Reserved Number*, to his white, 6 months 1 week 3 days-old; bred by exhibitor; sire, "Victor;" dam, "Beauty;" sire of dam, "Great Britain."

Breeding Sow Pigs of a Small White Breed—Pens of Three.

COLONEL THE HON. EDWARD G. D. PENNANT, M.P., Penrhyn Castle, Bangor, Carnarvonshire; FIRST PRIZE, 10*l.*, for his 7 months 3 weeks 3 days-old; bred by exhibitor; sire, "Lad;" dam, "Jessie;" sire of dam, "Dan."

LORD WENLOCK, Escrick Park, Yorkshire: SECOND PRIZE, 5*l.*, for his 7 months 2 weeks 3 days-old; bred by exhibitor; sire, "Cato 3rd;" dam, "Miss Kitty;" sire of dam "Farmer."

Breeding Sow Pigs of a Small Black Breed—Pens of Three.

GEORGE MUMFORD SEXTON, Wherstead Hall, Ipswich, Suffolk: FIRST PRIZE, 10*l.*, for "The Three Graces," black, 7 months-old (Suffolk); bred by exhibitor; sire, "Young Shortnose;" dam, "Battersea 1st Prize Sow;" sire of dam, "Negro."

SAMUEL GEATER STEARN, Brandeston, Wickham Market: SECOND PRIZE, 5*l.*, for his black, 5 months 2 weeks 1 day-old (Suffolk); bred by exhibitor; sire "Sambo;" dam, "Gipsy Queen;" sire of dam, "Negro."

Breeding Sow Pigs of the Berkshire Breed—Pens of Three.

JOHN KING TOMBS, Langford, Lechlade, Gloucestershire: FIRST PRIZE, 10*l.*, for his black and white, 7 months-old; bred by exhibitor.

JOSEPH DRUCE, Eynsham, Oxford: SECOND PRIZE, 5*l.*, for his black and white, 6 months 2 weeks 5 days-old; bred by exhibitor.

WILLIAM JAMES SADLER, Benthorne, Calcutt, Cricklade, Wiltshire: the *Reserved Number*, to his dark spotted, 7 months 2 weeks 5 days-old; bred by exhibitor; sire, "Mars;" dam, "Heavysides the 4th;" sire of dam, Rev. G. Bailey's "King of Warwick."

Breeding Sow Pigs of any other Breed—Pens of Three.

GEORGE MANGLES, Givendale, Ripon, Yorkshire: FIRST PRIZE, 10*l.*, for his white, 5 years 2 months 3 days-old (Yorkshire middle); bred by exhibitor.

JOSEPH WILSON, Manor House, Woodhorn, Morpeth, Northumberland: SECOND PRIZE, 5*l.*, for his white, 7 months 3 weeks 6 days-old (Improved Yorkshire); bred by exhibitor; sire, "Captain Cook;" dam, "Nanny;" sire of dam, "Peter the Great."

THOMAS RAMSAY, Sherburn Green, Gateshead: the *Reserved Number*, to his white, under 8 months old; bred by exhibitor; sire, "Willey Scott."

SPECIAL PRIZES GIVEN BY THE LOCAL COMMITTEE OF NEWCASTLE-UPON-TYNE.

CATTLE.

Galloway Bulls.

WILLIAM ROPER, Ling Side, Sebergham, Cumberland: FIRST PRIZE, 20*l.*, for "Rough Robin," black, 4 years 3 months 3 days-old; bred by exhibitor; sire, "Border Laddie;" dam, "Bonny Jeane;" sire of dam, "Rough Robin."

WILLIAM and JAMES SHENNAN, Bailig, Kirkcudbright: SECOND PRIZE, 10*l.*, for "Bob Burns," black, 9 years 3 months-old; bred by exhibitors; sire, "Geordie;" dam, "Martha;" sire of dam, "Galloway Jock."

ALEXANDER JARDINE, Applegirth, Lockerbie, N.B.: the *Reserved Number*, to "Hector," black, 3 years 5 months 1 week-old; bred by Mr. Cunningham, Tarbreoch, Castle Douglas, Kirkcudbright; sire, "Stanley;" dam, "Nancy."

SIR FREDERICK U. GRAHAM, BART., Netherby, Longtown, Cumberland: FIRST PRIZE, for "Eskdale," black, 1 year 5 months 3 weeks 4 days-old; bred by Mr. Cunningham, Whitecairn, Castle Douglas, Galloway.

JOHN CUNNINGHAM, Whitecairn, Dalbeattie, Kirkcudbrightshire: SECOND PRIZE, 10*l.*, for his black, 1 year 4 months 3 weeks-old; bred by John Wallace, Longburns, Kirkcudbright.

JAMES GRAHAM, Meikle Culloch, Dalbeattie: the *Reserved Number*, to "Glenorchy," black, 1 year 3 months 4 weeks-old; bred by William and James Shennan, Bailig, Kirkcudbright; sire, "Bob Burns" (235); dam, "Halliday."

Galloway Cows and Heifers.

JAMES GRAHAM, Meikle Culloch, Dalbeattie: FIRST PRIZE, 15*l.*, for "Semiramis" (703), black, 6 years 2 months 4 days-old, in-milk and in-calf; bred by exhibitor; sire, "Guardsman;" dam, "Hannah" (214); sire of dam, "Brother to Mosstrooper."

JOHN CUNNINGHAM, Whitecairn, Dalbeattie: SECOND PRIZE, 5*l.*, for "Kate," black, 8 years 3 weeks-old, in-milk and in-calf; bred by exhibitor; sire, "Bruce;" dam, "Beauty;" sire of dam, "Wellington."

JOHN CUNNINGHAM: the *Reserved Number*, to "Harriet," black, 5 years 4 months 2 weeks 3 days-old, in-milk and in-calf; bred by exhibitor; sire, "Kirkie;" dam, "Kate;" sire of dam, "Bruce."

JAMES GRAHAM: FIRST PRIZE, 10*l.*, for "Rose of Galloway," black, 2 years 4 months 2 weeks 3 days-old, in-calf; bred by exhibitor; sire, "Sir James;" dam, "Semiramis" (703); sire of dam, "Guardsman."

JAMES GRAHAM: FIRST PRIZE, 10*l.*, for "2nd Harriet," black, 1 year 5 months 2 weeks 1 day-old; bred by exhibitor; sire, "Clansman;" dam, "Semiramis" (703); sire of dam, "Guardsman."

JAMES CUNNINGHAM, Tarbreoch, Dalbeattie: SECOND PRIZE, 5*l.*, for "Diana," black, 1 year 5 months 1 week 6 days-old; bred by exhibitor; sire, "Nelson;" dam, "Jenny;" sire of dam, "Kirkie."

JAMES CUNNINGHAM: the *Reserved Number*, to "Juno," 1 year 4 months 2 weeks-old; bred by exhibitor; sire, "Nelson;" dam, "Nancy;" sire of dam, "Bruce."

HORSES.

Hunters.

SIR FREDERICK U. GRAHAM, BART., Netherby, Longtown, Cumberland: FIRST PRIZE, 20*l.*, "The Tyke," chesnut, 5 years-old (gelding); bred by Mr. Trotter (address unknown); sire of dam, "Sir Harry Dimsdale."

JOHN B. BOOTH, Killerby, Catterick, Yorkshire: SECOND PRIZE, 5*l.*, for "Beechwood," bay, 6 years-old (gelding); bred by Smart Atkinson, Beaumont Hill, Darlington; sire, "Lancewood;" sire of dam, "Lord Collingwood."

THOMAS SUTTON, Allwent Hall, Darlington: *Reserved Number*, to "Voyageur," dark chesnut, 6 years-old (gelding); bred by Mr. Reynolds, Navan, Meath; sire, "Jolly Tar;" sire of dam, "Spencer."

WILLIAM HARDISTY CLARK, Hook, Howden, Yorkshire: FIRST PRIZE, 20*l.*, for "Sprig of Nobility," bay, 4 years-old (gelding); bred by Crowther Harrison, Melton, Hull; sire, "Sprig of Shillelagh;" dam, "Marigold;" sire of dam, "Young Comas."

ROBERT NORMAN AND SON, High Close, Aspatria, Cumberland: **SECOND PRIZE**, 5*l.*, for "Radical," chesnut, 4 years-old (gelding); bred by exhibitors; sire, "A British Yeoman;" dam, "Chessie."

JOSEPH WHITWELL PEASE, Woodlands, Darlington: the *Reserved Number*, to "Silas Marner," chesnut, 4 years-old (gelding); bred by H. A. W. Cocks, Low Middleton Hall, Darlington; sire, "Greatheart;" dam, "Miss Julia;" sire of dam, "Luck's All."

JAMES B. BOYD, of Doddington, Wooler, Northumberland: **PRIZE**, 10*l.*, for his chesnut 3 years-old (gelding); bred by exhibitor; sire, "Auchenleck," dam, "Kate;" sire of dam, "The Little Known."

RICHARD WELLINGTON HODGSON, North Dene, Gateshead, Durham: the *Reserved Number*, to his bay 3 years-old (filly); bred by exhibitor; sire, "Neville;" sire of dam, "Cheviot."

Roadster Stallions.

THOMAS BROWN, Butterwick, Barton-le-Street, Malton, Yorkshire: **PRIZE**, 15*l.*, for "President Junior," bay, 9 years-old; bred by Mr. Newburn, Ingleby, Stokley, Yorkshire; sire, "Bay President;" sire of dam, "Lottery."

Roadster Mares or Geldings.

RICHARD FORSTER, White House, Gateshead: PRIZE, 10*l.*, for "Multum-in-parvo," brown, 7 year-old (gelding); bred by James Fogerty, Ballinahoge, New Ross, County Wexford; sire, "Clowe;" sire of dam, "Redwing."

Ponies.

REV. JOHN ALEXANDER BLACKETT ORD, Whitfield Hall, Haydon Bridge, Northumberland: PRIZE, 5*l.*, for "Little Stag," roan, 8 years-old (gelding); breeder unknown.

THOMAS RAMSAY, Sherburn Green, Gateshead: PRIZE, 10*l.*, for his white, aged (mare), in-foal; breeder unknown.

Pairs of Agricultural Mares or Geldings, or Mare and Gelding.

CHARLES MARK PALMER, Whitley Park, Newcastle-on-Tyne: PRIZE, 10*l.*, for "Dick," grey, 7 years-old (gelding); breeder unknown; "Sharper," bay, 7 years-old (gelding); breeder unknown.

THE DUKE OF HAMILTON AND BRANDON, Hamilton Palace, Hamilton, Lanarkshire, N.B.: the *Reserved Number*, to "Sally," bay, 4 years-old (mare); bred by Christie, Buchlynie, Stirling, N.B.; sire, "Blackleg;" "Maggie," bay, 6 years-old (mare); bred by William Park, Balquhanran, Dalmuir, Dumbartonshire; sire, "Sir Colin Campbell;" dam, "Jess."

Agricultural Geldings or Fillies.

THE DUKE OF HAMILTON AND BRANDON: FIRST PRIZE, 10*l.*, for "Darling," dark bay, 3 years-old (filly); bred by W. Knox, Foreside, Crofthead, Renfrewshire; sire, "Samson;" dam, "Bess."

JOHN MUIR, Lochfergus, Kirkcudbright: SECOND PRIZE, 5*l.*, for "Brisk," bay, 3 years-old (filly); bred by Mr. White, Highdykes, Dumbarton, N.B.

JOHN LAWS, Kearsley, Matfen, Northumberland: PRIZE 5*l.*, for his bay, 2 years-old (gelding); bred by exhibitor; sire, "Farmer's Glory;" dam, "Bet;" sire of dam, "Young Doddington."

JOSEPH LAYCOCK, Gosforth, Newcastle-upon-Tyne: FIRST PRIZE, 10*l.*, for his bay 1 year-old (filly); bred by exhibitor; sire, "George 2nd;" dam, "Gip."

JONATHAN MELVIN PATTISON, Norwood, Gateshead: SECOND PRIZE, 5*l.*, for his bay 1 year-old (filly); bred by exhibitor; sire, "England's Glory;" dam, "Jolly;" sire of dam, "Wallace."

JOSEPH WHITWELL PEASE, Woodlands, Darlington: the *Reserved Number*, to "Effie," dark bay, 1 year-old (filly); bred by exhibitor; sire, "England's Glory;" dam, "Jewel;" sire of dam, "Lofty."

SHEEP.

Border Leicester Rams.

GEORGE SIMSON, Courthill, in Berwickshire; Kelso, Roxburghshire: FIRST PRIZE, 15*l.*, for his 1 year 3 months 2 weeks-old; bred by exhibitor.

THOMAS SIMSON, Blainslie, Lauder, Roxburgh: SECOND PRIZE, 5*l.*, for his 1 year 4 months-old; bred by exhibitor.

GEORGE SIMSON, Courthill, in Berwickshire; Kelso: the *Reserved Number*, to his 1 year 3 months 2 weeks-old; bred by exhibitor.

THOMAS SIMSON, Blainslie, Lauder, Roxburghshire: FIRST PRIZE, 15*l.*, for his 3 years 4 months-old.

JOSEPH WILSON and JOHN ANGUS, Whitefield, Morpeth, Northumberland: SECOND PRIZE, 5*l.*, for "Cockburn 2nd," 3 years 3 months-old; bred by John Angus, of Whitefield, Morpeth, Northumberland; sire, "Cockburn 1st."

JOHN ANGUS, Whitefield, Morpeth: the *Reserved Number*, to "Cockburn 3rd," 2 years 3 months-old; bred by exhibitor; sire, "Cockburn 1st;" sire of dam, "Hawkhill."

Border Leicester Ewes—Pens of Five.

GEORGE SIMSON, Courthill, in Berwickshire; Kelso: FIRST PRIZE, 10*l.*, for his 1 year 3 months 2 days-old; bred by exhibitor.

JOHN ANGUS, Whitefield, Morpeth: SECOND PRIZE, 5*l.*, for his 1 year 3 months-old; bred by exhibitor; sire, "Cockburn 2nd."

THE HON. COL. EDWARD G. D. PENNANT, M.P., Penrhyn Castle, Bangor, Carnarvonshire: the *Reserved Number*, to his 1 year 3 months-old; bred by exhibitor.

WILLIAM PURVEY, of Lintow, Burnfoot, Kelso: FIRST PRIZE, 10*l.*, for his 2 years 3 months 2 weeks 3 days-old; bred by exhibitor; sire, "Hawkhill and Bob."

JOHN ANGUS, Whitefield, Morpeth: SECOND PRIZE, 5*l.*, for his 2 years 3 months-old; bred by exhibitor; sire, "Cockburn 1st."

Herdwick Rams.

GEORGE BROWNE, Troutbeck, Windermere, Westmoreland: FIRST PRIZE, 15*l.*, for his 1 year 2 months 2 weeks-old; bred by exhibitor.

RICHARD BROWNE, Lowwood, Troutbeck, Windermere: SECOND PRIZE, 5*l.*, for "Moorcock," 1 year 2 months 1 week-old; bred by exhibitor.

EDWARD NELSON, Gatesgarth, Buttermere, Cockermouth, Cumberland: the *Reserved Number*, to "Second Fiddle," 1 year 1 month 2 weeks-old; bred by exhibitor; sire, "Young Napoleon;" sire of dam, "General."

EDWARD NELSON: FIRST PRIZE, 15*l.*, for "Thousand-a-Year," 4 years 2 months-old; bred by exhibitor; sire, "General;" sire of dam, "Wasdale Champion."

GEORGE BROWNE, Troutbeck, Windermere: SECOND PRIZE, 5*l.*, for "No. 1," 7 years 2 months 2 weeks-old; bred by William Ritson, Wastel Head, Whitehaven, Cumberland.

DANIEL CROSTHWAITE, Hallgarth, Keswick, Cumberland: the *Reserved Number*, to his 4 years 2 months 2 weeks 6 days-old; bred by Isaac Hawall, Longscale, Keswick, Cumberland.

Herdwick Ewes—Pens of Five,

GEORGE BROWNE, Troutbeck, Windermere: FIRST PRIZE, 10*l.*, for his 1 year 2 months 2 weeks-old; bred by exhibitor.

EDWARD NELSON, Gatesgarth, Buttermere, Cockermouth: SECOND PRIZE, 5*l.*, for "Springflower," "Mayflower," "Queen," "Boss," "Dadden," 1 year 1 month 1 week-old; bred by exhibitor; sires, "Old Napoleon," "Young Napoleon," "Bloody Douglas," "Ned;" sires of dams, "General," "Joe," "Prince Talleyrand."

GEORGE IRVING, Wythrop Hall, Cockermouth: the *Reserved Number*, to his 1 year 2 months 2 weeks-old; bred by exhibitor.

WOOL.

Leicester—Five Fleeces.

JOHN ANGUS, Whitefield, Morpeth, Northumberland: PRIZE, 2*l.*: shorn 2nd week in May, 1864, from sheep 15 months-old.

Oxford Down—Five Fleeces.

CHARLES HOWARD, Biddenham, Bedford: PRIZE, 2*l.*: shorn in May, from shearlings.

Shropshire—Five Fleeces.

AMBROSE ROBOTHAM, The Oak Farm, Drayton Bassett, Tamworth, Staffordshire: PRIZE, 2*l.*: shorn 17th May, from sheep 15 months-old.

Hampshire—Five Fleeces.

WILLIAM HUMFREY, Oak Ash, Wantage, Berkshire: PRIZE, 2*l.*: shorn 8th June, from sheep 16 months-old.

Cheviot—Five Fleeces.

CHARLES REA, Doddington, Wooler, Northumberland: PRIZE, 2*l.*: shorn in June, from sheep 15 months-old.

Blackfaced—Five Fleeces.

ALEXANDER WEARING LONG, Mint Cottage, Kendal, Westmoreland: PRIZE, [illegible]*l.*: shorn in July, from sheep 2 to 3 years-old.

Herdwick—Five Fleeces.

EDWARD NELSON, Gatesgarth, Buttermere, Cockermouth, Cumberland: PRIZE 2*l.*: shorn 6th July, from sheep 2 and 2 years-old.

BUTTER.

Firkin.

JAMES NICHOLSON, Blencairn Hall, Penrith, Cumberland: PRIZE, 5*l.*

Fresh.

GEORGE MANDER ALLENDER, Lee Grange, Winslow, Buckinghamshire: PRIZE, 5*l.*

IMPLEMENTS.

STEAM CULTIVATION.

JOHN FOWLER and Co., 28, Cornhill, London, and Leeds: the PRIZE of ONE HUNDRED POUNDS, for their Set of Steam Cultivating Machinery without Implements; manufactured by the exhibitors. Comprising two 7-horse single-cylinder self-moving engines and windlasses combined, 800 yards best steel rope, 20 rope porters, and necessary tools. The engines to be worked in combination, so that the power of both engines is applied to the implement simultaneously.

JOHN FOWLER and Co.: the PRIZE of FIFTY POUNDS, for their Set of Steam Ploughing Machinery without Implements; manufactured by the exhibitors. Comprising a 14-horse power engine (self-moving) and windlass combined, an anchor, 20 rope porters, 800 yards best steel rope, headland ropes, and necessary tools.

JOHN FOWLER and Co.: the PRIZE of FIFTY POUNDS, for their Set of Steam Cultivating Machinery without Implements; manufactured by the exhibitors. Comprising one 7-horse power single-cylinder self-moving engine and windlass combined, anchor, 800 yards steel rope, 18 rope porters, and necessary tools.

JAMES and FREDERICK HOWARD, Britannia Works, Bedford: the PRIZE of TWENTY-FIVE POUNDS, for their Steam Cultivating Apparatus; invented and manufactured by the exhibitors. Ordinary 10-horse portable engine, with separate windlass, ropes, &c. The engine and windlass are stationed at one corner, or outside the field to be cultivated. Every variety of soil, and fields of any shape, can be worked.

JOHN FOWLER and Co.: the PRIZE of TWENTY POUNDS, for their Four-furrow Balance Plough and Digger, with Slack Gear; manufactured by the exhibitors.

J. and F. HOWARD: the PRIZE of TEN POUNDS, for their Four-furrow Steam Plough; invented and manufactured by the exhibitors. Constructed with 2 sets of bodies, right and left-handed, set point to point, and mounted upon strong flanged wrought beams. Scarifying and digging breasts can be substituted for the ordinary ploughing breasts.

JOHN FOWLER and Co.: the PRIZE of SEVENTEEN POUNDS TEN SHILLINGS, for their Five-tined Balance Digger and Cultivator with Slack Gear; manufactured by the exhibitors.

J. and F. HOWARD: the PRIZE of TWELVE POUNDS TEN SHILLINGS, for their Steam Cultivator and Ridging Plough Combined; invented and manufactured by the exhibitors. The same implement as Howards' well-known Steam Cultivator, but furnished with a ridging-body and subsoiler. Intended to ridge and subsoil the land at one operation.

WILLIAM STEEVENS, Godolphin Road, New Road, Hammersmith, Middlesex: a SILVER MEDAL, for his Four-furrow Steam Plough and Cultivator Combined; invented and improved by the exhibitor, and manufactured by J. Woodbourne, Kingsley. Is so well arranged that it can be made available for all general purposes of steam cultivation.

R. and H. COLEMAN and MORTON, London Road Works, Chelmsford, Essex: a SILVER MEDAL, for their Steam Cultivating Apparatus; invented by Yarrow and Hilditch, London, and improved and manufactured by exhibitors. Consisting of a 10-horse power double-cylinder traction-engine, with windlass, steel wire rope, 2 cultivators, anchors, porters, and field tools complete. With this apparatus alone direct action is secured with the use of one engine.

J. and F. HOWARD: the PRIZE of TWENTY POUNDS, for their Steam Harrows; invented and manufactured by the exhibitors. Is similar in principle to the exhibitors' zigzag-harrows for horse-power, but fitted with steerage, and adapted for steam-power.

JOHN FOWLER and Co.: the PRIZE of FIFTEEN POUNDS, for the best Windlass for Steam Power.

J. and F. HOWARD: the PRIZE of TEN POUNDS, for the second-best Windlass for Steam Power.

W. SAVORY and SONS, High Orchard Works, Gloucester: the PRIZE of FIVE POUNDS, for the third-best Windlass for Steam Power.

JOHN FOWLER and Co.: the PRIZE of TWENTY POUNDS, for the best Anchor for Steam Power.

AVELING and PORTER, Rochester, Kent: the PRIZE of TEN POUNDS, for their Rope Porter for Steam Power.

COLEMAN and MORTON: the PRIZE of FIVE POUNDS, for their Rope Porter.

RICHARD GARRETT and SON, Leiston Works, Saxmundham, Suffolk: HIGHLY COMMENDED, for their pair of Twelve-horse Power Winding Traction Engines; invented by Savory and Son, Gloucester; improved and manufactured by the exhibitors. For steam-cultivation.

J. and F. HOWARD: HIGHLY COMMENDED for their Two-furrow Steam Plough; invented and manufactured by the exhibitors. Intended for extra deep tillage.

JOHN FOWLER and Co.: HIGHLY COMMENDED for their Rope Porters.

J. and F. HOWARD: COMMENDED for their Norwegian Steam Harrow; invented and manufactured by the exhibitors. The same in principle as the well-known Norwegian Harrow, but fitted with steerage, and adapted for steam-power. Where a fine tilth is required, this is most effective.

J. and F. HOWARD: COMMENDED for their Rope Porters.

Ploughs.

James and Frederick Howard: the Prize of Fifteen Pounds, for their Plough (marked B B); invented and manufactured by the exhibitors. Intended for general purposes and deep work.

Ransomes and Sims, Ipswich, Suffolk: the Prize of Seven Pounds Ten Shillings, for their Iron Beam Plough (marked R N E), fitted with Two Wheels; invented, improved, and manufactured by the exhibitors. Has an improved solid beam trussed at its base, by which simplicity and strength are both attained. The wheels are new in design, their wearing surfaces are hardened, and dirt excluded, whilst the protruding axle is superseded. Fitted to produce square-cut work.

Ransomes and Sims: the Prize of Seven Pounds Ten Shillings, for their Iron Beam Plough (marked R N G), with Two Wheels; invented, improved, and manufactured by the exhibitors. For deep work. Capable of ploughing 10 to 12 inches deep on any soil. Strong enough for 4 or 6 horses.

Ransomes and Sims: the Prize of Fifteen Pounds, for their Iron Beam Plough (marked R N F), Swing; invented, improved, and manufactured by the exhibitors. For square-cut work.

Ransomes and Sims: the Prize of Seven Pounds Ten Shillings, for their Iron Beam Plough (marked R N E), Swing; invented, improved, and manufactured by the exhibitors. Has a short beam, and is fitted for swing-ploughing, suitable for light land. It will produce square-cut work.

McGregor and Humphrey, Spring Garden Works, Aberdeen: the Prize of Seven Pounds Ten Shillings, for their Heavy Land or Deep Furrow Swing Plough; invented, improved, and manufactured by the exhibitors. Without wheels; the share is of wrought-iron.

Hunt and Pickering, Goulding Works, Aberdeen, the Prize of Ten Pounds, for their Turf and Stubble-paring Plough; invented, improved, and manufactured by the exhibitors. Adapted for paring any thickness from 1 to 3 inches, cutting double the width of the ordinary plough, leaving the work done in an advantageous state for the action of the atmosphere; all the cutting parts and shield-boards are made of cast-steel.

E. H. Bentall, Heybridge, Maldon, Essex: the Prize of Ten Pounds for his Patent Subsoil Plough (marked B I B F); invented, improved, and manufactured by the exhibitor.

J. and F. Hancock, Dudley Port, Tipton, Staffordshire: a Silver Medal, for their Subsoil Pulverizer Plough; invented and manufactured by the exhibitors. Will act as a plough and subsoiler, or subsoiler only, for 3 to 12 inches deep.

J. and F. Howard: Highly Commended for their Plough (marked B); invented and manufactured by the exhibitors. Medium size of new set that have been brought out with the utmost care, and after careful and protracted experiments; the object sought being to combine the advantages of high-cutting ploughs, which lay the furrows at an acute angle, with those of the rectangular or low-cutting ones.

Ransomes and Sims: Highly Commended for their Iron Beam Plough (marked R N F), fitted with Two Wheels; invented, improved, and manufactured by the exhibitors. The mould-board and share are the result of many and careful experiments, and will be found to do first-rate work.

F. and J. HOWARD: HIGHLY COMMENDED for their Plough (marked B B); invented and manufactured by the exhibitors. Intended for very deep ploughing or trenching.

F. and J. HOWARD: HIGHLY COMMENDED for their Swing Plough (marked B B); invented and manufactured by the exhibitors. Without wheels, and with long handles and short beam. As the point of the share can be raised or lowered as it becomes worn, they have great advantage over the ordinary swing.

RANSOME and SIMS: HIGHLY COMMENDED for their Cotgreave's Subsoil Fen Land and Trench Plough; invented by Mr. Cotgreave, Chester; improved and manufactured by the exhibitors. Combines the common trench and subsoil plough in one implement, and will till and pulverize the soil at one operation from 6 to 18 inches.

WILLIAM BUSBY, Newton-le-Willows, Bedale, Yorkshire: HIGHLY COMMENDED for his Two-wheeled Plough, for General Purposes; invented, improved, and manufactured by the exhibitor.

SEAMAN, LARKWORTHY, and Co., Lowesmoor Works, Worcester: HIGHLY COMMENDED for their Excelsior Iron Plough with Two Wheels and Drag Chain (N X 2); invented by Joseph Seaman, Worcester, and manufactured by the exhibitors. Suitable for general purposes, both on light and heavy land; easy in draught for 2 horses, but has sufficient strength for 4; with steel breasts.

WILLIAM BALL and SON, Rothwell, Kettering, Northamptonshire: HIGHLY COMMENDED for their Heavy Land Plough; invented, improved, and manufactured by the exhibitors.

JOHN GEORGE HARRISON, Ravensworth, Richmond, Yorkshire: HIGHLY COMMENDED for his Scotch Double Mould-board or Ridging Plough; improved by the Rev. William F. Wharton, Barnington Rectory, and manufactured by the exhibitor. By this plough land can be ridged and three times split for the same horse-power and depth that it can be once ploughed by the ordinary plough. The land is thoroughly broken up.

WILLIAM BALL and Son: COMMENDED for their Iron Plough for Light Lands (B C X); invented, improved, and manufactured by the exhibitors.

HUNT and PICKERING: COMMENDED for their Light Land Iron Plough (G W O); invented, improved, and manufactured by the exhibitors. Its improvements effect the following objects:—Rigidity maintained under the greatest strain, and without additional weight; better balancing in work, thus insuring increased solidity, uniformity, and steadiness, with considerably less exertion to holder.

W. BALL and SON: COMMENDED for their Iron Plough for General Purposes (B C X); invented, improved, and manufactured by the exhibitors.

McGREGOR and HUMPHREY: COMMENDED for their Heavy-land or Deep Furrow Wheel-Plough; invented, improved, and manufactured by the exhibitors. Strong and powerful for deep and heavy work with 3, 4, or more horses.

McGREGOR and HUMPHREY: COMMENDED for their General Purpose Swing-Plough; invented, improved, and manufactured by the exhibitors. With wrought-iron share.

RANSOMES and SIMS: COMMENDED for their Beauclerk's Archimedean Subsoil-Plough; invented by Lord Beauclerk; improved and manufactured by the exhibitors. Will pulverize the soil in the operation of subsoiling, at a depth of 6 to 12 inches below the ordinary ploughing.

RANSOMES and SIMS: COMMENDED for their Strong 2-Horse Solid Beam Iron Plough (marked V R), fitted with Two Wheels; invented, improved, and manufactured by exhibitors. Adapted for any description of soil. Will turn a furrow 9 inches by 13½ inches.

CULTIVATORS, CLOD-CRUSHERS, ROLLERS, AND HARROWS.

E. H. BENTALL: the PRIZE of TWELVE POUNDS, for his Patent Light Broad-share, Cultivator, and Subsoil-Plough (marked L I B B); invented improved, and manufactured by the exhibitor.

COLEMAN and MORTON: the PRIZE of TEN POUNDS, for their Cultivator with Five Tines; invented by R. Coleman, Chelmsford; improved and manufactured by the exhibitors.

CHARLES, CLAY, the Stennard Works, Wakefield, Yorkshire: the PRIZE of EIGHT POUNDS, for his Patent Cultivator and Eradicator; invented, improved, and manufactured by the exhibitor. Is now in general use, and is applicable for all cultivating purposes. Fitted with side levers, seven tines and shares. The tines are raised out of the soil backwards, similar to a horse-rake, so as readily to relieve the implement when turning at the ends; width of cut 5 feet, and may be worked with 3 or 4 horses at a moderate depth.

THE BEVERLEY IRON AND WAGGON COMPANY: Beverley Iron Works, Beverley, Yorkshire; the PRIZE of NINE POUNDS, for their Patent Serrated Clod-Crusher and Roller, with Self-cleaning Action; improved and manufactured by the exhibitors. Each alternate disc is 3 inches larger in diameter than the rest, which enables it to work on moist soil without clogging.

WILLIAM CROSSKILL and SONS, Iron Works, Beverley: the PRIZE of SIX POUNDS, for their Improved Clod-Crusher; invented, improved, and manufactured by the exhibitors: 30 inches diameter, 6 feet wide.

W. C. CAMBRIDGE, Bristol: the PRIZE of FIVE POUNDS, for his Six-feet-and-a half Double-Action Press-Wheel Roller and Clod-Crusher, Wheels 26 inches diameter; invented, improved, and manufactured by the exhibitor. Fitted with tubular iron shafts and frame, and has grease boxes on the checks.

AMIES and BARFORD, Queen Street Works, Peterborough, Northamptonshire: the PRIZE of SEVEN POUNDS, for their Wrought-iron Water Ballasting Land-Roller; invented, improved and manufactured by the exhibitors. Made with two separate water-tight cylinders of best wrought-iron plates, which can be loaded with water at pleasure. The extra weight is then employed upon the surface of the land with the greatest possible percentage of crushing power, and two rollers (light and heavy) secured in one instrument.

THE BEVERLEY IRON AND WAGGON COMPANY: the PRIZE of THREE POUNDS, for their Warwick Prize Plain Field Roller; improved and manufactured by the exhibitors. Consists of nine cast-iron cylinders, each 2 feet 8 inches in diameter, and 8 inches wide, placed on a round axle, with arms having grease boxes and loose journals.

J. and F. HOWARD: the PRIZE of EIGHT POUNDS, for their 3-Beam Zigzag Harrows (No. 10); invented and manufactured by the exhibitors. Recommended as a heavy set of harrows, within the power of a pair of horses.

J. and F. HOWARD: the PRIZE of SEVEN POUNDS, for their Drag-Harrows (No. 17); invented and manufactured by the exhibitors. Width, 9½ feet.

J. and F. Howard: the Prize of Five Pounds, for their Jointed Zigzag-Harrows (No. 15); invented and manufactured by the exhibitor. Width, 8½ feet.

Coleman and Morton: Highly Commended for their Cultivator with Seven Tines (No. 9); invented by R. Coleman, Chelmsford, and improved and manufactured by the exhibitors.

Amies and Barford: Highly Commended for their Press-Wheel Clod-Crusher and Land-Roller; invented, improved, and manufactured by the exhibitors. Made with a new solid wrought-iron frame and steerage guide-rod, by which the draught is diminished one-third; also fitted with patent self-regulating scrapers and seat for the driver. Size, 26 inches diameter by 6 feet long.

Amies and Barford: Highly Commended for their Wrought-iron unbreakable Land-Roller; invented, improved, and manufactured by the exhibitors. The cylinders (in two parts) and the framing are made entirely of best wrought-iron, whereby the greatest strength with lightness is secured. The shafts are moveable, so that one or two horses can work abreast, as desired. Size, 7 feet long by 24 inches diameter; weight, about 7 cwt.

Ransomes and Sims: Highly Commended for their Set of Four-Jointed Harrows (No. 620); invented, improved, and manufactured by the exhibitors.

J. and F. Howard: Highly Commended for their Flexible or Chain-Harrow (F 2); invented and manufactured by the exhibitors. Made to cover 8 feet.

W. C. Cambridge: Highly Commended for his Seven-and-a-half feet Combined Tine and Chain-Harrow, 7½ feet long; invented, improved, and manufactured by the exhibitor. Combines all the essentials of the ordinary chain and the tine-harrow; for two horses.

S. Corbett and Son, Park Street Works, Wellington, Salop: Commended for their Cultivator, with Ten Tines; invented and manufactured by the exhibitors. Fitted with lever, &c., and adapted for broad-sharing stubbles, grubbing, and cultivating.

Hunt and Pickering: Commended for their Strong Wrought Field-Roller; invented, improved, and manufactured by the exhibitors. Fitted with three cylinders 24 inches diameter, 7 feet long, and so arranged as to remove the friction from the axle, excepting in the self-lubricating hard metal patent bushes; the axle-ends are case-hardened bushes easily renewed.

Hill and Smith, Brierley Hill Iron Works, Staffordshire: Commended for their Premium Wrought-iron Light Land-Roller (No. 1); invented and manufactured by the exhibitors. 7½ feet wide by 2 feet diameter. Can be drawn easily by one horse, and is light enough for barley-rolling.

Brick and Tile-Machines.

John Whitehead, Preston, Lancashire: the Prize of Five Pounds, for his No. 1 Drain-Pipe, Brick, and Tile-Machine; invented, improved, and manufactured by the exhibitor.

John Whitehead: the Prize of Ten Pounds, for his Vertical solid Brick-making-Machine: invented, improved, and manufactured by the exhibitor. Adapted only for solid bricks. A most suitable machine for exportation, as it may be worked by horse-power, steam, or water.

D. PINFOLD, Warwickshire Works, Rugby: the PRIZE of FIVE POUNDS, for his Drain-pipe and Brick-making Machine; invented by Wright and Green and the exhibitor, and improved and manufactured by the exhibitor. Is self-acting and continuous; simple, strong, and durable; makes very superior bricks and pipes, in quantities limited by the means of removal only, and at a cost of from 2*s.* to 2*s.* 9*d.* per 1000.

MISCELLANEOUS.

.. B. CHILDS, 481, New Oxford Street, London, and RICHES and WATTS, Duke's Palace Iron Works, Norwich: a SILVER MEDAL, for their Excelsior Grain-Separator (No. 3 size); invented and improved by A. B. Childs, and manufactured by Riches and Watts. Combining the action of blast, riddles, and exhaust, with an entirely new and improved arrangement of the riddles, by which oats and other foreign substances are effectually separated without waste.

.. B. CHILDS, and RICHES and WATTS: a SILVER MEDAL, for their Portable Self-sharpening American Grist-Mill; invented by Amory Felton, of Troy, U.S.A.; improved and manufactured by Riches and Watts. Very superior for grinding all kinds of grain for feeding purposes. Warranted to grind faster and more efficiently than any metal mill out. Arranged on a high stand; so as to grind into a sack.

URGESS and KEY, 95, Newgate Street, London: a SILVER MEDAL, for their Set of Draining Tools; invented, improved, and manufactured by Parkes and Co.

MIES and BARFORD: HIGHLY-COMMENDED for their Steam-power Chaff-Cutter, with Blast Delivering Apparatus; invented, improved, and manufactured by the exhibitors. The novelty in this machine consists in a newly patented fan or elevator attached to the machine, by which the cut chaff can be delivered in any direction from the machine, and to any height desired, without manual labour.

Essays and Reports.—PRIZES FOR 1865.—**All Prizes of the Royal Agricultural Society of England are open to general competition. Competitors will be expected to consider and discuss the heads enumerated.**

I. MIDDLE CLASS EDUCATION.

FIFTY SOVEREIGNS will be given for the best Essay on Middle Class Education, having reference to the improvement of the education of those who depend upon the cultivation of the soil for their support.

II. AGRICULTURE OF LEICESTERSHIRE.

FIFTY SOVEREIGNS will be given for the best Report on the Agriculture of Leicestershire.

The principal geological and physical features of the county should be described; the nature of the Soil and character of the Farming in its different districts or natural divisions; its Live Stock; Implements; recent changes of Farm Management; Improvements lately introduced and still required; remarkable or characteristic Farms; the condition and management of Pasture Land, any increase or decrease in its area, any improved means for its renovation or enrichment, any change in the uses to which it is applied, being especially noticed.

III. SHEEP STOCK.

TWENTY-FIVE SOVEREIGNS will be given for the best Essay on the Increase of Sheep Stock on Strong as well as Light Land.

IV. SHORTHORNS.

TWENTY-FIVE SOVEREIGNS will be given for a Short History of Rise and Progress of Shorthorns.

V. CHEESE AND BUTTER.

TWENTY-FIVE SOVEREIGNS will be given for the best Essay on the Comparative Profit of making Cheese, Butter, or of grazing Stock on Pasture Land of various qualities.

VI. WATER SUPPLY.

Twenty Sovereigns will be given for the best Essay on the Improvement of the Water Supply in Rural Parishes for Agricultural and Domestic Purposes.

VII. FARM BUILDINGS.

Twenty Sovereigns will be given for the best Essay on the Comparative Cheapness and Advantages of Iron and Wood in the construction of Roofs for Farm Buildings.

VIII. RECLAMATION AND MARLING OF LAND.

Twenty Sovereigns will be given for the best Account of the Reclamation of Waste or Inferior Land by Marling or Dry Warping.

IX. ANY OTHER AGRICULTURAL SUBJECT.

Ten Sovereigns will be given for an approved Essay on any other Agricultural Subject.

Reports or Essays competing for the Prizes must be sent to the Secretary of the Society, at 12, *Hanover Square, London, on or before March* 1, 1865. *Contributors of Papers are requested to retain Copies of their Communications, as the Society cannot be responsible for their return.*

RULES OF COMPETITION FOR PRIZE ESSAYS.

1. All information contained in Prize Essays shall be founded on experience or observation, and not on simple reference to books or other sources. Competitors are requested to use foolscap or large letter paper, and not to write on both sides of the leaf.

2. Drawings, specimens, or models, drawn or constructed to a stated scale, shall accompany writings requiring them.

3. All competitors shall enclose their names and addresses in a sealed cover, on which only their motto, the subject of their Essay, and the number of that subject in the Prize List of the Society, shall be written.*

4. The President or Chairman of the Council for the time being shall open the cover on which the motto designating the Essay to which the Prize has been awarded is written, and shall declare the name of the author.

5. The Chairman of the Journal Committee shall alone be empowered to open the motto-paper of any Essay not obtaining the Prize, that he may think likely to be useful for the Society's objects; with a view of consulting the writer confidentially as to his willingness to place such Essay at the disposal of the Journal Committee.

6. The copyright of all Essays gaining Prizes shall belong to the Society, who shall accordingly have the power to publish the whole or any part of such Essays; and the other Essays will be returned on the application of the writers; but the Society do not make themselves responsible for their loss.

7. The Society are not bound to award a prize unless they consider one of the Essays deserving of it.

8. In all reports of experiments the expenses shall be accurately detailed.

9. The imperial weights and measures only are those by which calculations are to be made.

10. No prize shall be given for any Essay which has been already in print.

11. Prizes may be taken in money or plate, at the option of the successful candidate.

12. All Essays must be addressed to the Secretary, at the house of the Society, on or before the 1st of March, 1864.

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* Competitors are requested to write their motto on the enclosed paper on which their names are written, as well as on the outside of the envelope.

Members' Privileges of Chemical Analysis.

The Council have fixed the following rates of Charge for Analyses to be made by the Consulting Chemist for the *bonâ-fide* use of Members of the Society; who (to avoid all unnecessary correspondence) are particularly requested, when applying to him, to mention the kind of analysis they require, and to quote its number in the subjoined schedule. The charge for analysis, together with the carriage of the specimens, must be paid to him by members at the time of their application.

No. 1.—	An opinion of the genuineness of Peruvian guano, bone-dust, or oil-cake (each sample)	5*s*.
„ 2.—	An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts, and ammonia	10*s*.
„ 3.—	An estimate of the value (relatively to the average of samples in the market) of sulphate and muriate of ammonia, and of the nitrates of potash and soda	10*s*.
„ 4.—	An analysis of superphosphate of lime for soluble phosphates only	10*s*.
„ 5.—	An analysis of superphosphate of lime, showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia ..	£1.
„ 6.—	An analysis (sufficient for the determination of its agricultural value) of any ordinary artificial manure	£1.
„ 7.—	Limestone:—the proportion of lime, 7*s*. 6*d*.; the proportion of magnesia, 10*s*.; the proportion of lime and magnesia	15*s*.
„ 8.—	Limestone or marls, including carbonate, phosphate, and sulphate of lime, and magnesia with sand and clay ..	£1.
„ 9.—	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1.
„ 10.—	Complete analysis of a soil	£3.
„ 11.—	An analysis of oil-cake, or other substance used for feeding purposes; showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre; as well as of starch, gum, and sugar, in the aggregate	£1.
„ 12.—	Analyses of any vegetable product	£1.
„ 13.—	Analyses of animal products, refuse substances used for manure, &c.	from 10*s*. to 30*s*.
„ 14.—	Determination of the "hardness" of a sample of water before and after boiling	10*s*.
„ 15.—	Analysis of water of land drainage, and of water used for irrigation	£2.
„ 16.—	Determination of nitric acid in a sample of water	£1.

N.B.—*The above Scale of Charges is not applicable to the case of persons commercially engaged in the Manufacture or Sale of any Substance sent for Analysis.*

The Address of the Consulting Chemist of the Society is, Dr. Augustus Voelcker, 101, Leadenhall Street, London, E.C., to which he requests that all letters and parcels (postage and carriage paid) should be directed.

Members' Veterinary Privileges.

I.—Serious or Extensive Diseases.

No. 1. Any Member of the Society who may desire professional attendance and special advice in cases of serious or extensive disease among his cattle, sheep, or pigs, and will address a letter to the Secretary, will, by return of post, receive a reply stating whether it be considered necessary that Professor Simonds, the Society's Veterinary Inspector, should visit the place where the disease prevails.

No. 2. The remuneration of the Inspector will be 2*l.* 2*s.* each day as a professional fee, and 1*l.* 1*s.* each day for personal expenses; and he will also be allowed to charge the cost of travelling to and from the locality where his services may have been required. The fees will be paid by the Society, but the travelling expenses will be a charge against the applicant. This charge may, however, be reduced or remitted altogether at the discretion of the Council, on such step being recommended to them by the Veterinary Committee.

No. 3. The Inspector, on his return from visiting the diseased stock, will report to the Committee, in writing, the results of his observations and proceedings, which Report will be laid before the Council.

No. 4. When contingencies arise to prevent a personal discharge of the duties confided to the Inspector, he may, subject to the approval of the Committee, name some competent professional person to act in his stead, who shall receive the same rates of remuneration.

II.—Ordinary or Other Cases of Disease.

Members may obtain the attendance of the Veterinary Inspector on any case of disease by paying the cost of his visit, which will be at the following rate, viz., 2*l.* 2*s.* per diem, and travelling expenses.

III.—Consultations without visit.

Personal consultation with Veterinary Inspector	5*s.*
Consultation by letter	5*s.*
Consultation necessitating the writing of three or more letters.	10*s.*
Post-mortem examination, and report thereon	10*s.*

A return of the number of applications during each half-year being required from the Veterinary Inspector.

IV.—Admission of Diseased Animals to the Veterinary College; Investigations, Lectures, and Reports.

No. 1. All Members of the Society have the privilege of sending cattle, sheep, and pigs to the Infirmary of the Royal Veterinary College, on the same terms as if they were Members of the College; viz., by paying for the keep and treatment of cattle 10*s.* 6*d.* per week each animal, and for sheep and pigs "a small proportionate charge to be fixed by the Principal according to circumstances."

No. 2. The College has also undertaken to investigate such particular classes of disease, or special subjects connected with the application of the Veterinary art to cattle, sheep, and pigs, as may be directed by the Council.

No. 3. In addition to the increased number of lectures now given by Professor Simonds—the Lecturer on Cattle Pathology—to the pupils in the Royal Veterinary College, he will also deliver such lectures before the Members of the Society, at their house in Hanover Square, as the Council shall decide.

No. 4. The Royal Veterinary College will from time to time furnish to the Council a detailed Report of the cases of cattle, sheep, and pigs treated in the Infirmary.

GOVERNORS AND MEMBERS

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

1864.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

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†Dartmouth, Earl of...Patshall Hall, Wolverhampton
De Grey and Ripon, Earl...Studley Royal, Ripon
De La Warr, Earl...Buckhurst Park, East Grinstead, Sussex
Denison, John Evelyn, M.P....Ossington, Newark, Nottinghamshire
†Derby, Earl of, K.G....Knowsley Hall, Prescot, Lancashire
Dering, Sir Edw. Cholmeley, Bart., M.P....Surrenden-Dering, Pluckley, Kent
Devonshire, Duke of, K.G....Holker Hall, Milnthorpe, Westmoreland
Dickinson, Francis Henry...King's Weston, Somerton, Somersetshire
Downshire, Marquis of...Easthampstead Park, Wokingham, Berks
†Dysart, Earl of...Buckminster Hall, Colstersworth, Lincolnshire

Egmont, Earl of...Cowdray Park, Petworth
Essex, Earl of...Cassiobury Park, Watford, Hertfordshire
†Etwall, Ralph...Andover
Evans, Thomas William, M.P....Allestree Hall, Derby
†Eversley, Viscount...Heckfield Place, Winchfield, Hants
†Exeter, Marquis of, K.G....Burghley House, Stamford, Lincolnshire
†Eyre, Charles...Welford, Newbury, Berkshire

Farquharson, John James...Langton, Blandford
Feilding, Viscount...Downing, Holywell
†Fellowes, Edward, M.P....Ramsey Abbey, Huntingdon
Feversham, Lord...Duncombe Park, Helmsley, Yorkshire
†Fortescue, Earl...Castle Hill, South Molton, Devon
†Freeland, H. W....Chichester
†Fuller, Francis...21, Parliament Street, S.W.

Gibbs, Ben. Thomas Brandreth...47, Half-moon Street, London, W.
†Grey, Earl...Howick House, Alnwick

Hale, Robert Blagden...Alderley Park, Wootton
†Hamilton-Nisbet, Right Hon. R. D. C....Bloxholme Hall, Sleaford, Lincolnshire
Hamond, Anthony...Westacre Hall, Brandon
†Harcourt, George Simon...71, St. George's Square, S.W.
Hartley, W. H. H....Lye Grove, Cross Hands, Sodbury, Gloucestershire
Hayter, Right Hon. Sir Wm. G., Bt., M.P....Stowberry Park, Wells, Somersetshire
†Heneage, George Fieschi, M.P....Hainton Hall, Wragby
†Henniker, Lord...Thornham Hall, Eye, Suffolk
†Heywood, Thomas Percival...Claremont, Manchester
†Hill, Viscount...Hawkstone Park, Shrewsbury
†Hobbs, William Fisher...Boxted Lodge, Colchester
†Hoghton, Sir Henry de, Bart....Bold Hall, Warrington
†Holford, R. Stayner, M.P....Weston Birt House, Tetbury, Gloucestershire
Holland, Edward, M.P....Dumbleton Hall, Evesham, Worcestershire
Hood, Hon. Major-General A. Nelson...Cumberland Lodge, Windsor

†**Hulse**, Col. Sir Edward, Bart....Breamore House, Fordingbridge, Hampshire
†**Hunt**, Zachary D....Aylesbury

Johnstone, Sir John V. B., Bart., M.P....Hackness Hall, Scarborough

Kerrison, Sir Edward Clarence, Bart., M.P....140, Piccadilly, W.
†**Knight**, Frederick Winn, M.P....Wolverley House, Kidderminster

†**Leconfield**, Lord...Petworth House, Sussex
†**Le Couteur**, Colonel...Belle Vue, Jersey
Legh, William John...Lyme Park, Disley, Stockport
†**Leicester**, Earl of...Holkham Hall, Norfolk
†**Leigh**, Lord...Stoneleigh Abbey, Warwickshire
Lemon, Sir Charles, Bart....Carclew, Penrhyn, Cornwall
†**Long**, Walter, M.P....Rood Ashton, Trowbridge, Wilts
†**Lonsdale**, Earl of...Lowther Castle, Penrith
Lovelace, Earl of...East Horsley, Ripley, Surrey

Marlborough, Duke of...Blenheim Park, Oxon
†**Marshall**, William, M.P....Pattendale Hall, Penrith
†**Miles**, Sir William, Bart., M.P....Leigh Court, Bristol, Somersetshire
Mills, Thomas...Tolmers, Hertford
Montefiore, J. M....Worth Park, Crawley
†**Morrison**, Alfred...Fonthill House, Hindon, Wilts
Murray, Charles Robert Scott...Danesfield, Marlow, Buckinghamshire

Naper, James Lennox William...Lough Crew, Old Castle, Ireland
†**Northwick**, Lord...Athenæum Club, S.W.

Palmer, Robert...Holme Park, Reading, Berkshire
Patten, Col. John Wilson, M.P....Bank Hall, Warrington, Lancashire
Pennant, Hon. Col. Edw. Gordon Douglas, M.P....Penrhyn Castle, Bangor
†**Perkins**, Algernon...Hanworth Park, Hounslow, W.
†**Popham**, Francis Leyborne...Littlecott, Hungerford, Berks
†**Portman**, Lord...Bryanston House, Blandford, Dorsetshire
†**Powis**, Earl of...Powis Castle, Welshpool

†**Radnor**, Earl of...Coleshill House, Highworth, Wilts
Rayleigh, Lord...Terling Place, Witham, Essex
Ridley, Sir Matthew White, Bart., M.P....Blagdon, Cramlington, Northumberland
Rigg, Jonathan...4, Chester Place, Hyde Park Square, W.
Robartes, Thos. J. Agar, M.P....Lanhydrock House, Bodmin
Rogerson, John...St. Alban's Villa, Highgate Rise, N.
†**Rutland**, Duke of...Belvoir Castle, Grantham

Saint Germans, Earl of...Port Eliot, Devonport
†**Sanford**, Edward Ayshford...Nynehead Court, Wellington, Somersetshire
†**Scholey**, William Stephenson...Freemantle Lodge, Castle Hill, Reading
†**Shadwell**, Lucas...Fairlight, Hastings
Shelley, Sir John Villiers, Bart., M.P....Maresfield Park, Uckfield, Sussex
Shrewsbury and Talbot, Earl of...Ingestre, Staffordshire
†**Smith**, John Abel, M.P....37, Chester Square, S.W.
†**Sondes**, Lord...Elmham Hall, Elmham, Norfolk

Sotheron-Estcourt, Rt. Hon. Thos. H. S. B. E., M.P.... Bowden Park, Chippenham
†Southampton, Lord... Whittlebury Lodge, Towcester
Stafford, Lord... Cotessy Hall, Norwich
Stanhope, John Spencer... Cannon Hall, Barnsley, Yorkshire
†Stradbroke, Earl of... Henham Park, Wangford, Suffolk
†Sutton, John Manners... Kelham, Newark, Notts

†Tanqueray, John Samuel... Hendon, Middlesex
Taunton, Lord... Stowey, Somersetshire
†Thompson, H. S., M.P.... Kirby Hall, York
†Thorold, Sir John Charles, Bart.... Syston Park, Grantham
†Torrington, Viscount... Yokes Court, Mereworth, Kent
Towneley, Lieut.-Col. Charles... Towneley, Burnley, Blackburn
†Tunno, Edward Rose... Warnford Park, Bishop's Waltham
Tuxford, George Parker... 246, Strand, W.C.

Wales, H.R.H. Prince of, K.G.... Marlborough House, S.W.
Walsh, Sir John, Bart., M.P.... Warfield Park, Bracknell, Berkshire
Walsingham, Lord... Merton Hall, Thetford, Norfolk
†Warner, Edward, M.P.... Higham Hall, Woodford
†Warwick, Earl of... Warwick Castle, Warwick
Westminster, Marquis of, K.G.... Motcombe House, Shaftesbury
†Whitbread, William Henry... Southhill House, Bedford
†Williams-Chancellor, Rev. Sir Erasmus, Bt.... Llanywormwood Pk., Carmarthensh.
Wilmot, Edward Woollett... Buxton, Derbyshire
†Wilson, Fuller Maitland... Langham Hall, Bury St. Edmund's
†Wilson, Henry... Stowlangtoft Hall, Bury St. Edmund's
Wilshere, William... The Frythe, Welwyn
Wynn, Sir Watkin Williams, Bart., M.P.... Wynnstay, Rhuabon, Denbighshire

Zetland, Earl of... Aske Hall, Richmond, Yorkshire

List of Members.

† Life Member's mark.

A.

†Abbey, George...Silsworth Lodge, Daventry
Abbey, John...The Grange, Wellingborough
Abbot, Chas. H....Bower, Long Ashton, Bristol
Abbott, Evelyn...Lowdham, Nottingham
†Abbott, Stephen, jun....Castleacre, Swaffham
Abbott, Wm...Hill Farm, Gt. Wigborough, Colchester
Abell, James, Leopard Grange, Worcester
Abell, Martin, Worcester
Abercorn, Marquis of, K.G....Chesterfield Ho., W.
†Abergavenny, Earl of...Birling Manor, Maidstone
Abraham, Rev. T. E....Barton Place, Mildenhall
Abraham, Thomas...Dunster, Taunton
†Abrey, Thos. S. H....Witham, Essex
†Ackers, James...Prinknash Park, Painswick
Acland, Sir Pere. P. F. Palmer, Bart....Bridgewater
Acland, Thos. Dyke...Sprydoncote, Exeter
Acock Arthur, Cold Aston, Northleach
Ackroyd, William...Westbourne Lodge, Otley
†Acworth, N. B....The Hook, Northaw, Middlesex
†Adair, A...Heatherton Park, Wellington, Somerset
Adair, Sir R. Shafto, Bart....20A, St. James's Square
Adam, Alexander...Boulogne-sur-Mer
Adams, Capt. G. Curtis, R.N...Anstey Hall, Coventry
Adams, G. T....Hawkhurst, Kent
Adams, Thos....New House, Marden, Herefordshire
Adams, William, Blaydon on Tyne
Adcock, William...Farndish, Wellingborough
†Adderley, Rt. Hon. C. B., M.P..Hams Hall, Minworth
Adeane, Henry J., M.P...Babraham Pk., Cambridge
Adkins, George C....The Lightwoods, Birmingham
Adney, John...Rowton, Wellington, Salop
†Ahrens, E...New Schlagsdorf, Schwerin, Mecklenbg.
Airey, George...Sherbrooke, Linden, Malvern
Akers, Henry...Black Bourton, Faringdon
†Akroyd, Edward, M.P...Bank Field, Halifax
Alder, Frederick John...Hagworthingham, Spilsby
Alderman, Rev. F. C....Kintbury, Hungerford
Alderman, Robert...Farndish, Wellingborough
†Alderson, John...Thornby Villa, Wigton
Aldous, Robert...Burlingham, Norwich
Aldridge, Edward...Chippenham Court, Slough
†Aldridge, Major John...17, Cadogan Place, S.W.
†Aldworth, W., jun....Frilford, Abingdon
Alexander, Caledon...30, Belgrave Square, S.W.
†Alexander, Edward...Leominster
†Alington, G. M....Swinhope House, Grimsby
Alison, John...Brightlands, Reigate
†Allcroft, J. D....Worcester
Allday, John...Griston, Watton, Norfolk
†Allen, B. Haigh...Longcrofts Hall, Lichfield
Allen, Chas. W....The Moor, Kington, Herefords.
Allen, Henry...Oakfield, Hay, Herefordshire
Allen, John R....Lyngford House, Taunton
Allen, Major Ralph S....Bathampton, Bath
Allen, Rev. Dr...Shouldham Hall, Downham Market
Allen, N....The Vache, Chalfont St. Giles, Bucks
Allen, J. Roscoe...Oak House, Preston, Lancashire
Allen, Stephen H....Eastover, Andover
Allen, Thomas...Thurmaston, Leicester
Allen, Thomas...Upton Cottage, Macclesfield
Allen, W....Wallsend, Newcastle-on-Tyne
Allen, W.T...Little Stambridge Hall, Rochford, Essex
Allenby, George...Hallington, Louth, Lincolnshire
†Allfrey, H.W...Hemingford Ho., Stratford-on-Avon
†Allfrey, Robert...Wakefield Park, Reading
Allender, G. M....Manor Farm, Quainton, Winslow
Allerton, Alex. R....Colemans, Prittlewell, Essex
Allington, Rev. J....Little Barford, St. Neot's, Hunts
Allison, James...Undercliffe, Sunderland
Allison, Wm. H....Bilby, East Retford
Allison, Wm. Henry...Hepburn Hall, Gateshead
Allix, Charles...Willoughby Hall, Grantham
Allnutt, Henry...200, Fleet Street, E.C.
Allsopp, Henry...Foremark Hall, Burton-on-Trent
†Ambler, Henry...Watkinson Hall, Halifax
Ames, John...Clevelands, Lyme, Dorset
Ames, Lionel...The Hyde, St. Alban's
†Amhurst, W. A. T....Didlington Park, Brandon.
Amos, Chas. E...5, Cedars Road, Clapham Common
†Anderson, Alexander...
Anderson, A...12, Marlborough Cres., Newc.-on-Tyne
Anderson, David...10, Kenilworth Square, Dublin
Anderson, James, jun....Hedley Hall, Gateshead
Anderson, John...Cottingwood, Morpeth
†Anderson, R....Grey Street, Newcastle-upon-Tyne
Anderson, Robert A....Cirencester
Anderson, William...Bent House, South Shields
Anderton, G. jun....Howden Dyke, Howden, Yorks
Anderton, J....Cleckheaton, Leeds
Andrewes, C. J....Kate's Grove Iron-Works, Reading
Andrews, Charles...Harewood, Ross
Andrews, Henry...Wishford, Salisbury
Andrews, J....Kinnersley, Severn Stoke, Worcester
Angas, Wm....Neswick, Driffield
Angus, George...The Grange, Wallsend
Angus, John...Whitefield, Morpeth
Angus, John, jun....Whitefield, Morpeth
Angus, John...90, Percy Street, Newcastle-on-Tyne

Ankers, Robert B....Huxley Green, Chester
†Annandale, P....Shotley Grove, Newcastle-on-Tyne
†Anson, Sir John, Bart....Avisford, Arundel
Anstey, Samuel...Monabilly Farm, Par Station
Anstice, J....Madeley Wood, Wellington, Salop
†Anstruther, J. H. L....Hintlesham Hall, Ipswich
†Aplin, Henry..Combe St.Nicholas, Chard, Somerset
†Appach, Reginald..Maytham Hall, Rolvenden, Kent
Appleby, John...Abbey Mills, Morpeth
Appleby, W....Smallburn, Longhorsley, Northumb.
†Applewhaite, Edward..Pickenham Hall, Swaffham
Apps, John, jun....Goudhurst, Staplehurst
†Araujo, Captain F. J. da Silva...Rio de Janeiro
†Arbuthnot, John A....Cowarth, Chertsey, Surrey
Arbuthnot, W. U....Bridgen Place, Kent
†Arcedeckne, Andrew...Glevering Hall, Suffolk
Archer, James...Combermere Abbey, Salop
Argent, John...Manor Farm, Egham
Arkcoll, Thomas...The Meads, Eastbourne
Arkell, H....Butlers' Ct., Boddington, Cheltenham
†Arkell, T....Pen Hill Farm, Swindon, Wilts
Arkell, Thomas...Boddington, Cheltenham
Arkle, Thomas...Shaftoe, Newcastle-upon-Tyne
Arkwright, Rev. J....Mark Hall, Harlow, Essex
Arkwright, Peter...Willersby, Matlock
Armitage, Arthur...Moraston, Ross, Herefordshire
Armstrong, C...HawthornTer., Newcastle-upon-Tyne
Armstrong, G...Heddon-on-the-Wall, Northumb.
Armstrong, George...Thornton Heath, Surrey
Armstrong, H., M.D...Peckham Ho., Peckham, S.E.
Armstrong, John...Palterton, Chesterfield
Armstrong, J. A....Bays Leap, Wylam, Northum.
Armstrong, Pearson...Newcastle-on-Tyne
Armstrong, Robert...Over Tabley, Knutsford
Armstrong, Wm. Jones...Killylea, Co. Armagh
Armytage, Col. H...
Arnold, Matthew...Westmeon, Petersfield
Arnold, Rev. Richard A....Ellough, Beccles
Arnot, James...Woodcote, Carshalton, S.
Arnould, Alfred Henry...Whitecross, Wallingford
Arthur, Lieut.-Col. C....Misterton Hall, Lutterworth
Ashby, James...Pleystone, Capel, Dorking
Ashby, T. W....Rutland Terrace, Stamford
Ashcroft, James...Cow Lane, Wavertree, Liverpool
Ashcroft, Thomas...Walford, Eccleshall, Staffs.
Ashdown, S. H....Uppington, Wellington, Salop
Ashhurst, John H....Waterstock, Oxford
Ashlin, John...Firsby, Spilsby
Ashmore, John...Norton, Evesham
Ashton, G. F....Stormer Hill, Totlington, Bury
†Ashton, Henry...Woolton, Liverpool
†Ashton, T. Henry...
Ashwin, Henry...Guiting Power, Winchcombe
Ashwin, Manley C....Ryon Hill, Stratford-on-Avon
Ashwin, Richard...Aldington, Evesham
†Askew, Sir H., Bt....Pallinsburn Ho., Coldstream
†Askew, Watson...Pallinsburn, Coldstream
†Astbury, Wm. C....4, Munster Ter., Fulham, S.W.
Asten, William...Oddingley, Droitwich
Astley, F. D. R....Duckinfield, Ashton-under-Lyme
†Astley, F. L'Estrange...Melton Constable, Thetford
†Aston, Samuel...Bushwood Lodge, Warwick
†Atherton, Tho....Chapel House, Speke, Liverpool
†Athorpe, J. C....Dinnington Hall, Rotherham
Athreton, George T....Beech Cottage, Wrexham
Atkins, A. Edwin...Farnham Court, Slough, Bucks
Atkinson, Benj....Manston Lodge, Whitkirk, Leeds
Atkinson, E....Laurel Bank, Potternewton, Leeds
Atkinson, G. C....Wylam Hall, Northumberland
†Atkinson, James...Winderwath, Penrith
†Atkinson, J. H. H....Angerton, Morpeth
Atkinson, John...Charlton, Salisbury
Atkinson, John...Peepy, Stocksfield-on-Tyne
Atkinson, Thomas...Newcastle-on-Tyne
†Atkinson, W....Gt. Rapers, Bures St. Mary's
Atkinson, W. S....Barrowby Hall, Whitkirk, Leeds
Atkinson, William...Ashton Heyes, Chester
†Atkinson, W. James...Marlow, Buckinghamshire
Attenborough, J....Brampton Ash, Market Harbro'
Attwater, J. Gay...Ablington, Amesbury
Austin, W. H....Norton Shiffnal
Aveland, Lord...Normanton Park, Stamford
Aveling, Thomas...Rochester
Avery, Thomas Charles...Gloucester
†Avery, Wm. Howard...Stockton Grange, Shiffnal
Awbery, F. D....St. Lawrence Wootton, Basingstoke
Ayles, Stephen..Hall Pl. Farm, Braishfield, Romsey
†Aylesford, Earl of...Packington Hall, Coventry.
†Aylmer, H....West Dereham, Stoke Ferry, Norfolk
†Aylmer, J. B....Fincham Hall, Downham, Norfolk
Aylmer, John H....Walworth Castle, Darlington
†Aylmer, R. B....Westacre Abbey, Swaffham
†Aynsley, J. Murray...Underdown, Ledbury
Ayton, J. F...Hindley, Stocksfield, Northumberland
Ayton, F....Hindley, Stocksfield, Northumberland
Ayton, George H....Hindley, Newcastle-on-Tyne
†Aytoun, R. S....Inchdairnie, Kirkcaldie, N.B.

B.

†Babington, Chas. C., M.A...St. John's, Cambridge
†Back, John Alfred...Thorpe Hamlet, Norwich
Bacon, Rev. H....Baxterley Rectory, Atherstone
Bacon, James, Pluckley, Ashford, Kent
Bacon, Samuel, jun....Ratcliffe Culey, Atherstone
†Backhouse, Edmund...Polam Hill, Darlington
Badcock, Benjamin...Broad Street, Oxford
Badcock, Henry...Taunton
Badcock, P....4, Aldridge Rd. Villas, Westbourne Pk.
Badham, G. D....Bulmer, Sudbury
Badham, George...Beckford, Tewkesbury
Bagnall, Henry A....Winlaton, Blaydon-on-Tyne
†Bagot, Lord...Blithefield, Rugeley, Staffordshire
Bagster, Benjamin...Denmead, Horndean
Bailey, Henry...The Gerwyn, Wrexham
†Bailey, James...Nynehead, Wellington, Somerset
†Bailey, Wm....Hazling, Belford, Northumberland
†Baillie, Evan...St. Austin's, Torquay
†Baillie, Hamilton...Ash Hall, Cowbridge
Baillie, Wm. Hunter...4, Upper Harley Street, W.
Baily, Rev. H. G....The Vicarage, Swindon
Baily, J., sen....113, Mount St., Berkeley Square, W.
Baily, T. F....Hall Place, Leigh, Tunbridge
Bainbridge, E. M....Leazes Villa, Newcast.-on-Tyne
Bainbridge, Robt. S....Woodhorn Grange, Morpeth

Bainbrigge, W. H...Woodseat, Ashbourne, Derbysh.
Baker, Anne...Grendon, Atherstone
Baker, Benjamin Heath...Acle, Norwich
Baker, Chas. Newcombe...Half-moon Passage, E.C.
†**Baker**, Sir E. Baker, Bart...Ranston Ho., Blandford
Baker, Eliza Maria...Thorngrove, Worcester
Baker, George W....Parknook, Quorndon, Derby
Baker, H. Orde Lloyd..Hardwicke Court, Gloucester
Baker, Hugh Massey...Kidnall, Malpas
Baker, James...Drayton Bassett, Tamworth
Baker, John...Hockley, Rayleigh, Essex
†**Baker**, John...
†**Baker**, Lake J....Hargrave, Kimbolton
Baker, Robert...Garnston, East Retford
Baker, S. Camfield...Beaufort St., King's Rd., S.W.
†**Baker**, T. Barwick L...Hardwick Court, Gloucester
Baker, Thomas...Barton, Cambridge
Baker, William...Purewell House, Christchurch
†**Baker**, William H...Westington, Campden, Glouc.
Baldwin, B. F. ...The Ox Leasowes, Tardebigg
†**Baldwin**, John...Luddington, Stratford-on-Avon
Baldwin, Thomas...Glasnevin, Dublin
Baldwin, Wm. Hen....Normanton Hall, Normanton
Balfour, D....Balfour Castle, Kirkwall, N.B.
Ball, Capt. Thomas...85, Stephen's Green, Dublin
Ballard, Philip...Leighton Court, Hereford
†**Balmer**, Thomas...Fochabers, N.B.
Balston, Thomas...Chart Sutton, Staplehurst
Bancks, James...Prebendal House, Thame
Bancroft, William...Clifton Campvill, Tamworth
†**Bankes**, John Scott...Soughton Hall, Northop
†**Banks**, John Jackson...Kendal
Banks, Wm. J...West Cliff, Dover
†**Bannerman**, Alexander...South Cottage, Chorley
†**Bannerman**, Henry...Hunton Court, Maidstone
Bannister, J. S...Weston, Pembridge, Herefordshire
Banwell, William...Little Marlow, Bucks
Barber, George...Titlington Mount, Alnwick
Barber, Miles...Barlborough, Chesterfield
Barber, S. W...Hayton Castle, Bawtry
Barber, William...Elm Hill, Grimley, Worcester
†**Barbour**, George...Bolesworth Castle, Chester
†**Barbour**, R....Bolesworth Castle, Chester
Barchard, F....Horsted Place, Horsted, Uckfield
Barclay, John...Falmouth
†**Barclay**, G. R....Keavil, Dunfermline, Fifeshire
Barford, William...Peterborough
Baring, Hon. and Rev. F...Melchit Park, Salisbury
Baring, John...Oakwood, Chichester
Barker, C. D....Newcastle-on-Tyne
Barker, C. S....12, Buckingham St., Adelphi, W.C.
†**Barker**, Edward...Ruddington, Notts
†**Barker**, G. I. Raymond...20, Royal Crescent, Bath
†**Barker**, H.B. Raymond...University Cl., Suffolk St.
Barker, H....Suffolk Fire Office, Bury St. Edmund's
Barker, J. H....Rowsley, Bakewell, Derbyshire
Barker, Thomas, North Shields
Barker, Walter R. H....Wantage
Barlow, F...The Shrubbery, Hasketon, Woodbridge
Barlow, Rev. P....Cockfield Rec., Staindrop, Darlingtn.
Barnard, Charles...Norwich
Barnard, Fulke Toovey...Albion Chambers, Bristol
Barnardiston, Nathaniel C....The Ryes, Sudbury
†**Barneby**, J. Habington...Brockhampton, Worcester
†**Barneby**, William...Clater Park, Bromyard
Barnes, C....Chorley Wood House, Rickmansworth
Barnes, Ralph...Exeter
†**Barnes**, T....The Quinta, Chirk, N. Wales
Barnes, Thomas...Westland, Moynalty, co. Meath
Barnes, Wilson...Toft, Bourne
†**Barnett**, Charles..Stratton Pk., Biggleswade, Beds
Barnett, Henry...Glympton Park, Woodstock
Barnett, J....Remenham Hill, Henley-on-Thames
Barnett, R....Meopham Court, Gravesend
Barnett, William E....Newcastle-on-Tyne
Barrass, James...Cramlington, Northumberland
Barrass, M., sen....Killingworth, Newcastle-on-Tyne
Barrass, M., jun....Killingworth, Newcastle-on-Tyne
Barratt, John R....Maiden Hill, Penrith
Barrett, Alfred...Reading
Barrett, G. A....Kate's Grove Iron-Works, Reading
Barrett, John B....Milton House, Steventon, Berks
Barrington, Visc....Beckett House, Faringdon, Berks
Barroby, Miss Elizabeth...Dishforth, Thirsk
†**Barrow**, Chas. James...Southwell, Notts
†**Barrow**, John James...Normanton Hall, Southwell
†**Barrow**, Wm....Bilbrooke House, Wolverhampton
Barrs, T....Brompton Hall, Churchstoke, Salop
†**Barstow**, Charles D....Garrow Hill, York
Barter, Rev. C....Sarsden, Chipping Norton
Barter, George...Nunnington, Hereford
Bartholomew, W....Waddington Heath, Lincoln
†**Barthropp**, N. G....Hacheston, Wickham Market
†**Barton**, Charles...Holbrook House, Wincanton
†**Barton**, Charles...Fifield, Lechlade
Barton, Charles...Coln Rogers, Gloucester
Barton, Gerard...Fundenhall, Wymondham
†**Barton** John...Westleigh Lodge, Leigh, Lancashire
†**Barton**, Rev. H. N....St. Ervan Rectory, Padstow
Barton, Rev. Joseph...East Leigh, Havant
†**Barton**, J. H....Stapleton Park, Pontefract
Barton, Richard...Caldy Manor, Birkenhead
†**Barwell**, Thomas...Leicester
Baskerville, H...Crawshay Park, Reading, Berks
Bass, Michael T., M.P....Burton-on-Trent
Bass, W....Duckenfield Lodge, Ashton-under-Lyme
Bassett, Richard...Bonvilstone, Cardiff
Bastard, T. Horlock...Charlton Marshall, Blandford
†**Batard**, T. M. Bearda...Ramsden Crays, Billericay
Batchelor, T. B....Maindee, Newport, Monmouthsh.
Bate, Edward...Kelsterton, Flintshire, N.W.
Bate, Richard Stokes...Badger, Shiffnal
Bate, Samuel...Springfields, Newcastle-under-Lyme
†**Bateman**, Henry...Asthally, Witney
†**Bates**, George...Blaxhall Hall, Wickham Market
Bates, Thomas, jun....Eaton Green, Luton, Beds
Bathurst, Earl...Cirencester, Gloucestershire
Bathurst, Hon. Wm. L....38, Half-moon Street, W.
Bathurst, Lt.-Col., M.P...Clarendon Pk., Salisbury
†**Batson**, Thos....Combe House, Bath
Batt, William Henry...West Drayton, Uxbridge
†**Battcock**, F...Hemingford Abbotts, St. Ives, Hunts
Batten, Abraham...Ayott St. Peter's, Welwyn
†**Batten**, John...Yeovil
Battle, John R....Potter Hanworth, Lincoln
Baugham, Geo. A....Bridgenorth, Salop

†Baxendale, J....Woodside, Whetstone, N.
Baxendale, Richard B....Woodside, Whetstone, N.
Baxter, H. J...Cheadle, Manchester
Baxter, Robert...Doncaster
Baxter, Thomas...Acton Grange, Warrington
†Bayden, Thomas...Hythe, Kent
Bayes, Charles...Kettering
Bayley, Daniel (Captain)...Tallaght, co. Dublin
Bayley, Thomas...Lenton, Nottingham
Bayley, William...Britwell Farm, Maidenhead
Bayne, William...High Street, Oxford
Baynes, G....South Prestyn Lodge, South Shields
Bayning, Rev. Lord...Honingham Hall, Norfolk
Bayzand, Joseph...Kingley Arrow, Alcester
Beach, John A....The Hill, Staunton Swan, Worc.
Beach, Joseph...Flour Mill, Dudley
†Beach, Sir M.E.H., Bt., M.P. Williamstrip Pk., Fairfd.
Beachell, John...Rawcliffe, Selby, Yorkshire
Beadel, Wm. James...Chelmsford
Beadon, Rev. F....North Stoneham Rectory, Hants
Beale, E. T....237, High Holborn, W.C.
Beale, Jos....Boro' Fields, Walton, Burton-on-Trent
†Beale, William...Larkins Farm, Chiddingstone
Bealey, J. Edward...Bloxwich, Walsall, Staffs.
Beamand, William...Newcastle, Clun, Salop
†Bean, Alf. W....Dansom Park, Welling, S.E.
†Bearcroft, E....Mere Hall, Droitwich
Beard, John...Linton, Burton-on-Trent
Beard, W....Tormarton, Cross Hands, Chippenham
Beards, Thomas...Stowe Park, Buckingham
Bearn, William...Finedon Hill, Higham Ferrers
†Beart, Robert...Godmanchester, Huntingdonshire
Beasley, John...Brampton, Northampton
†Beattie, James...Newbie House, Annan, N.B.
Beauchamp, Chas. D....93, Lansdowne Road, W.
Beauchamp, Sir T. W. B., Bt...Langley Hl., Norwich
Beaumont, E. B....Woodhall, Barnsley, Yorkshire
Beaumont, Francis H....Buckland Court, Reigate
†Beaumont, Geo., jun....Bridgeford Hill, Notts
†Beaumont, J. A....Park House, Wimbledon, S.W.
Beaumont, Richard...Settrington House, York
†Beaumont, W.B., M.P..Bywell Hall, Newc.-on-Tyne
Beaven, Charles...Clyffe Pypard, Wootton Bassett
Becher, Rev. John Drake...Southwell
Beck, Charles W....Upton Priory, Macclesfield
Beck, J....St. Ann Street, Lynn, Norfolk
Beck, Peter...Shrewsbury
Beck, W. A....Esthwaite Lodge, Hawkshead, Lanc.
Beckett, Richard Trim...Oulton Farm, Tarporley
Beckitt, Richard...Watton Abbey, Driffield
Beckwith, Rev. H..Eaton Constantine, Wellngtn., Sal.
†Beckwith, Thos. Percival...52, Eaton Place, S.W.
Beddard, J....Holloway Ho., Prestwood, Stourbridge
Beddoe, Richard C....4, Whetherell Place, Clifton
Beecroft, William...Upton, Chester
Beever, Rev. William Holt...Cowbridge
Beevor, Henry...Blyth, Worksop
Beevor, John, M.D....Newark-on-Trent
Begbie, Alexander...Lytham, Preston, Lancashire
†Begg, David, M.D....Canons Park, Edgware, N.W.
Belcher, Charles...Little Coxwell, Faringdon
†Beldam, Valentine...Royston, Hertfordshire
†Bell, Daniel...Hollins, Whitehaven
Bell, Capt. Henry...Chalfont Lodge, Cheltenham
Bell, John...Breaks Hall, Appleby, Westmoreland
Bell, Matthew...Bourne Park, Canterbury
Bell, Matthew...Woolsington, Newcastle-on-Tyne
Bell, Robert...Newcastle-on-Tyne
Bell, Thos...Marlborough Cres., Newcastle-on-Tyne
Bell, William...Cramlington, Northumberland
Bell, William...4, Westgate, Newcastle-on-Tyne
Bell, William Read...Gillingham, Bath
Bell, Williams R....Gillingham, Bath
†Bence, Capt....Kentwell Hall, Long Melford
Bence, Henry A....Thorington Hall, Saxmundham
Benington, T...Wallingfen Ho., North Cave, Yorks.
†Bennell, Joseph...Hitchin, Herts
†Bennett, B. E...Marston Trussell Hall, Rugby
Bennett, E. ...Bedstone Ho., Aston-on-Clun, Salop
Bennett, George...30, Fenchurch Street, E.C.
Bennett, Rev. Henry Thorpe...Egham
Bennett, James...Ingestone, Ross
Bennett, John...Little Rissington, Burford, Oxon
Bennett, John Ewins...Bosworth Grange, Rugby
Bennett, Jos. B. H....Tutbury, Burton-on-Trent
Bennett, T....Park Farm, Woburn, Bedfordshire
Bennett, Thos. Oatley...Bruton, Somersetshire
Bennett, Wm....Regent Street, Cambridge
Bennion, Ed. David...Summer Hill, Oswestry
Benson, Alan...Papcastle, Cockermouth
†Benson, George...Lutwyche Hall, Wenlock, Salop
Benson, John...Tavistock
†Benson, William...Allerwash House, Hexham
Bentall, Edward H....Heybridge, Maldon, Essex
Bentley, Henry...Eshald House, Woodlesford, Leeds
Bentley, Robert John...Firmingley Park, Bawtry
Bentley, Wm. Handy...Sansome Place, Worcester
Benyon, Rev. E. R....Culford Hall, Bury St. Edm.
†Benyon, R., M.P....Englefield House, Reading
Berger, Wm. Thomas...Saint Hill, East Grinstead
Beridge, Rev. Basil...Algarkirk, Spalding
Berkeley, Cuthbert...Marley Hill, Gateshead
†Berkeley, Robert...Spetchley Park, Worcester
†Berners, John...Holbrook, Ipswich
†Berners, Lady...Keythorpe Hall, Leicester
†Berney, Sir Hanson, Bart....Sheepy, Atherstone
†Berrington, A. D....Pant y Goitre, Newport, Mon.
Besley, Henry...South Street, Exeter
Bessborough, Earl of...Pilltown, Ireland
†Best, Hon. and Rev. S....Abbotts Ann, Andover
Best, Jas., jun....The Hill Top, Tenbury
Best, Rev. Thomas..Red Rice House, Andover
Bethell, William...Rise, Beverley
Bettinson, R....Cawthorpe, Bourne, Lincolnshire
Betts, John...King's Langley, Hertfordshire
Bevan, Beckford...Bury St. Edmund's
Beverley, Matthew B....Leeds
Beviss, John...Sydling, Dorchester, Dorset
Bickford, Joseph...Oxley, Wolverhampton
Biddell, G. Arthur...Ipswich
†Biddell, Herman...Playford, Ipswich
†Biddell, Manfred...Playford, Ipswich
†Biddell, W....Hawstead Hall, Bury St. Edmund's
Biddulph, Col. R. M., M.P..Chirk Castle, Chirk, N.W.
Bidwell, Charles...Muriels, Ely
Biehl, John...Crowhurst, Battle

Biel, W.... St. Leonard's Farm, Beaulieu, Southpton.
Bigg, E. Smith...The Hyde, Slaugham, Sussex
Bigg, T...Leicester House, Great Dover Street, S.E.
Bigge, Chas. Selby..Bourton Grange, Much Wenlock
Biggs, John...Cublington, Leighton Buzzard
Bill, John...Trent Vale, Stoke-on-Trent
Billington, Leonard...Bull Hotel, Preston, Lancashire
Bingham, Col. R.H...Binghams Melcombe, Dorchester
†Birch, George Francis...Clare Park, Farnham
Birch, Thomas...Grafton Farm, Hereford
Birch, Wyrley...Wretham Park, Thetford
†Birchall, T...Kibbleton Hall, Preston, Lancashire
†Bircham, William G....Dunton, Fakenham
Bird, Geo....Chessington Court, Kingston, S.W.
†Bird, J....Yaxley, Stilton, Huntingdonshire
Bird, Josiah...Shouldham Abbey, Downham Market
†Bird, Rev. J. Waller...Briston, East Dereham
†Birkbeck, Henry...Norwich
†Birkbeck, Robert...Gatton, Reigate
Birket, C....Plungington Hall, Preston, Lancashire
Birkin, Richard...Apsley Hall, Nottingham
Birmingham, Wm....Killerton, Broadclist, Devon
Birt, Jacob...30, Sussex Gardens, Hyde Park, W.
Biscoe, T.P.B....Kingellie House, Newton, Inverness
Bishop, James...Stretton Hall, Penkridge
Bishop, John...3, The Walk, Market Pl., Norwich
Bitton, E. C....Newcastle-on-Tyne
Black, Edward...High Street, Boston
Black, James...
Blackbourn, D....Temple Brewer, Sleaford, Linc.
Blackburne, Jas. Taddy...17, Parliament St., S.W.
Blackburne, J. Ireland...Hale, Warrington
Blackburne, Lt.-Col. I., jun....Hale Hall, Warrington
Blackden, J. C....Heathcrslaw House, Coldstream
†Blacker, M. M....Claremount, Claremorris, Mayo
Blackett, Sir E., Bart....Matfen, Newcastle-on-Tyne
Blackett, E. A., R.N...Oakwood, Wylam, Northum.
Blackstone, J....1, Gloucester Rd., Regent's Pk., N.W.
Blagrave, Col. John...Calcot Park, Reading
†Blair, John...
Blair Thomas...Mitford, Morpeth
Blake, Alfred...Sutton, Stanton-Harcourt, Witney
Blake, Francis John...Norwich
Blake, William...Bridge, South Petherton
Blake, Wm. John...Danesbury, Welwyn
Bland, George...Coleby Hall, Lincoln
Bland, William...Hartlip, Sittingbourne
Blandford, Thomas...Corbridge, Northumberland
Blane, Col. Robt....The Oaks, Sunninghill, Staines
Blanshard, H. E....Jesmond Dene Hall, Newcastle
†Blanshard, Richard...53, Chancery Lane, W.C.
Blashill, Henry...Steps Farm, Downhill, Hereford
†Blathwayt, George Wm....Dyrham, Chippenham
Blencowe, J. George, M.P.... Bineham, Lewes
†Blencowe, Robert A....21, Gt. George St., S.W.
Blencowe, Robert Willis...The Hooke, Lewes
Blenkinsop, John...Simonside Ho., South Shields
Blenkinsop, Samuel...Lobley Hill, Gateshead
Blenkiron, William...Middle Park, Eltham
Blick, John...Hill Court, Droitwich
Blinkhorn, Thomas...Spalding
†Blissett, Rev. H....Letton, Weobley, Hereford
Blomfield, John...Warham, Wells, Norfolk

Bloomer, G. B...The Farm, Lower Stonnall, Walsall
Bloxsidge, Samuel...Warwick
Blundell, J....Bursleden, Southampton
Blundell, John...Crook Hall, Chorley
Blundell, W. H....27, Snow Hill, Birmingham
Blurton, W. Mountfort...Field Hall, Uttoxeter
Blyth, D'Urban...Great Massingham, Rougham
Blyth, H. E....Sussex Farm, Burnham, Lynn
†Blyth, James...24, Hyde Park Gardens, W.
†Board, John...Westerham, Sevenoaks
Boards, Edward...Edmonton, N.
Boards, William...Edmonton, N.
†Boby, Charles...Stutton, Ipswich
†Boby, Robert...Bury St. Edmund's
Bodenham, Charles...Hereford
†Body, R. B....Hyde End, Shinfield, Reading
Boger, Deeble...Wolsdon, Devonport
†Boghurst, William P....Frating Abbey, Colchester
Bogue, John Morris...Westward Park, Wigton
Boileau, Sir J.P., Bt...Ketteringham Pk. Wymndhm.
Boiston, Thomas...Shipcote, Gateshead
Bolam, C. G....Bentinck Terr., Newcastle-on-Tyne
Bolam, Harry G....Keverstone, Staindrop, Durham
Bolam, W. T....Bentinck Terr., Newcastle-on-Tyne
Bolden, Samuel E....Springfield Hall, Lancaster
†Bolitho, Edward...Pendlverne, Penzance
†Bolitho, T. S....Pendlverne, Penzance
†Bolitho, William...Penzance
†Bolton, Lord...Bolton Hall, Bedale
Bolton, Daniel...Offington, Worthing
Bolton, G. Frost...1, Pleasant Row, Newc.-on-Tyne
Bomford, Benjamin...Pitchill, Evesham
Bomford, Heming James...Dunnington, Alcester
Bond, Barnabas...Alburgh, Harleston, Norfolk
Bond, Benjamin...Draycot, Cheadle, Staffordshire
Bond, Frederick...Whitelackington, Ilminster
Bond, George.. Earl Soham, Wickham Market
Bond, Rev. N....Creech Grange, Wareham
Bond, Robert...10, Queen Street, Ipswich
Bone, Henry...Avon, Ringwood, Hants
Bonnell, J. H....Pelling Place, Old Windsor
†Bonner, H. C....East Rudham, Rougham, Norfolk
Bonner, W. Griffiths...Holme Lacy, Hereford
Bonus, Schröder...Point House, Blackheath, S.E.
†Booth, James Godfrey...Hamburgh
Booth, John B....Killerby, Catterick, Yorkshire
Booth, John...Cotham, Newark, Nottinghamshire
Booth, Richard...Warlaby, Northallerton
Booth, S. Lister...Bramley, Leeds
Borman, Luke...Irby, Caistor, Lincolnshire
Booth, Sir Williamson, Bt....Paxton Park, St. Neots
†Borough, C. B....Chetwynd Pk., Newport, Salop
Borries, Christian...Quay, Newcastle-on-Tyne
Borries, Theo....Greenside Ho., Blaydon-on-Tyne
Borston, Thomas...Shipcote, Gateshead
Borthwick, John...Prospect, Carrickfergus
†Bortier, Monsieur...La Panne
Borton, John...Barton-le-Street, Malton
Bosanquet, Rev. R. W....Roch, Alnwick
Bosley, John...Lower Leyde, Hereford
Bostock, Ellis...41, Hunter St., Brunswick Sq., W.C.
Bostock, Thomas...Hill Top, Burslem
Bosworth, J. Green...Greetham, Oakham, Rutland

†Botham, George...Wexham Court, Slough, Bucks
Botly, Wm....Salisbury Villa, Upper Norwood, S.
Bott, William...Nantwich
Botteley, Thos. Downes..Black Lake, W. Bromwich
Botting, William...Westmeston Pl., Hurstpierpoint
Boucherett, Henry Robert...Hoarcross, Rugeley
†Bouck, John T....Manchester
Boultbee, J....Noyadd Ho., Aberayron, South Wales
†Bourn, J....Mawley, Cleobury-Mortimer
Bourne, John...Hildenstone, Stone, Staffordshire
Bourne, John...N. E. Railway, Newcastle-on-Tyne
Bourne, Sam....Goldsmith Ho., Whitchurch, Salop
Bourne, Thomas...Newcastle-on-Tyne
Bourne, William...Atherstone
Bouverie, Philip Pleydell...Brymore, Bridgewater
Bowen, J., jun....Dunvall Ho., Bridgenorth, Salop
Bowen, P. W....Shrawardine Castle, Shrewsbury
†Bower, Edw. Greaves..Closworth, Sherborne, Dorset
Bower, Capt. Thomas B...Iwerne House, Blandford
Bower, George...St. Neots
Bowler, Wm. Anthony...9, Whitehall Place, S.W.
Bowley, William...Cirencester
Bowly, David...Cirencester
Bowly, Edward...Siddington House, Cirencester
Bowser, R...Bishop Auckland, Durham
†Bowstead, Thomas...Eden Hall, Penrith
†Bowyer, Capt. H. A....Steeple-Aston, Woodstock
Box, John...Civil Engineer
Boxall, W. B....Strathfieldsaye, Winchfield
Boyd, E. Fenwick...Moor House, Durham
Boyer, W....Pywell House, Northampton
Boys, John...Goldhanger, Maldon
Boys, Robert...Eastbourne
Braby, James...Maybanks, Rudgwick, Horsham
Bracebridge, C. H....Atherstone Hall, Atherstone
Bradburn, William...Hilton, Wolverhampton
Bradburne, J. Hanbury...Pipe Place, Lichfield
Bradbury, Thomas...Longroyd, Brighouse
Bradbury, Thomas Swanwick...Winsford, Cheshire
Bradbury, Wm....Bradley Green Colliery, Congleton
Braddock, Henry...Bury St. Edmund's
Bradford, Thomas...Cathedral Steps, Manchester
Bradley, Thomas...Richmond, Yorkshire
†Bradshaw, John...Knowle, Guildford
Bradshaw, W...Slade Ho., Levenshulme, Manchester
Bradstock, Thomas S....Cobrey Park, Ross
Brady, Henry Bowman...Newcastle-on-Tyne
Braginton, George...Torrington, Devon
†Braikenridge, J. H....Chew Magna, Bristol
Bramley, Charles...Fiskerton Hall, Lincoln
Bramwell, C....Hardwicke Hall, Ferry Hill, Durham
Brand, Hon. Henry, M.P....Glynde, Lewes
†Brander, R. B....Tanbridge House, Horsham
Brandon, Benjamin...Ross, Herefordshire
Branson, William Chas....Little Weldon, Wansford
Branwhite, F...Chapel House, Long Melford, Suffolk
Brasnett, J....Hilboro' Lodge, Brandon, Norfolk
Bravender, John...Cirencester
Bray, George...The Haven, Dilwyn, Leominster
†Braybrooke, Lord...Audley End, Saffron Walden
†Breach, J. G....
Breavington, W. G. K...Bath Road, Hounslow, W.
Brebner, James..Norfolk Farm, Windsor Great Park

Brett, John...Burton Joyce, Nottingham
Brett, John...Oxton Grange, Southwell
Brett, John Lowdham...Corfe Lodge, Wimborne
Brett, Wilford George...The Lodge, Esher
†Bretts, Chas....
Brewster, Jas....2, Westbourne Road, Barnsbury, N.
Brewster, S. N....Beacon Hill House, Woodbridge
Brewster, W....Balderton Hall, Windillo, Shrews.
Brickwell, C. J....Overthorpe Lodge, Banbury
Bridge, Thomas...Wynford Eagle, Dorchester .
Bridge, Thomas...Buttsbury, Ingatestone
Bridges, Joshua...London Road, Worcester
Briggs, John A....Eastgate House, Tenterden
Briggs, Rev. T. Barker W...Caple Lodge, Folkestone
Briggs, William...Hylton Castle, Sunderland
Bright, J....Longford, Market Drayton, Shropshire
†Bright, John...Teddesley Park Farm, Penkridge
Bright, John, M.D....19, Manchester Square, W.
†Brisco, Sir Robert, Bt....Crofton Hall, Wigton
†Brise, Lieut.-Col. S.B.R...Finchingfield, Braintree
†Broadhurst, John...Foston, Derby
Broadmead, Philip...Milverton, Somerset
Brodhurst, Lucas, Manton, Worksop
Brodie, John...Newcastle-on-Tyne
Brodie, John, jun....Newcastle-on-Tyne
Bromet, William R....Cocksford, Tadcaster
Bromfield, H...Hollow Meadow, Stratford-on-Avon
Bromley, James...Cockerham, Lancaster
Bromley, John...Derby
Bromley, John...Lancaster
Bromley, Robert...Derby
Bromwich, Thomas...Woolston, Coventry
Brook, Arthur Sawyer...Bexhill, Hastings
Brook, J...Park Farm, St. Helen's, Isle of Wight
Brooke, Edward...Marsden House, Stockport
Brooke, John W....Sibton Park, Yoxford, Suffolk
Brooke, John, jun....Capel, Ipswich
Brooke, Rev. John...Haughton, Shiffnal
†Brooke, Sir R., Bart....Norton Priory, Runcorn
Brooke, T. J. Langford...Mere Hall, Knutsford
†Brooke, William...Northgate House, Huddersfield
†Brooke, Sir W. De Capell, Bart....Market-Harbro'
†Brooks, Bernard...Lyford, Abingdon
Brooks, J. Crosse...Carville, Newcastle-on-Tyne
Brook, James H....Henley-on-Thames
Brooks, J. M....7, Charlotte Street, Manchester
Brooks, Samuel...Bank, Manchester
Broomfield, Thomas...Lauder, N.B.
Broomfield, Thomas...Quay, Newcastle-on-Tyne
Broomhall, T. T...Beech Cliff, Newcastle, Staffords.
Brough, Charles...Blackett St., Newcastle-on-Tyne
†Broughton, Capt. J. P., jun...Tunstall Hall
Broughton, Capt. P....Cherry Mount, Kells, Ireland
Broughton, E. Delves...Wistaston Hall, Nantwich
Broughton, J...Almington Hall, Market Drayton
Browell, Edmund J. J....East Boldon, Gateshead
Brown, B....Manor House, Shipbourne, Tunbridge
Brown, Cuthbert...2, Derwent-pl., Newc.-on-Tyne
Brown, David...Cathendine House, Brecon
Brown, David...North Earle, Wooler, Alnwick
†Brown, Douglas...15, Hertford Street, Mayfair
Brown, Edw....4, Chesterfield St., Euston Rd., N.W.
Brown, George...Avebury, Chippenham

G....Burdon Place, Jesmond, Newc.-on-Tyne
, George...Roborough House, Barnstaple
, George...Troutbeck, Windermere
n, Rev. H. H....
, Henry...Ashby-de-la-Zouch
, James...26, Battery Place, Rothsay, N.B.
, John...Tring
, John...Coldham Hall, Wisbeach
, John...Compton, Newbury
, J. Washbourne...Ufcott, Swindon
, Rev. Lancelot R....Kelsall, Saxmundham
, Martin...Benton, Newcastle-on-Tyne
, Michael L....Cliff Ville, Stoke-on-Trent
n, Potto...Houghton, Huntingdon
, Professor Geo. Thomas...Cirencester
, Ralph...Whickham, Gateshead
, Richard...Cippenham, Slough
, Robert...Wigginton House, Tamworth
n, Thomas...Buckham Hall, Uckfield
n, Thomas...Marham, Downham Market
, Thos. James...The Moor, Hereford
, Thomas...Townsend, Horton, Devizes
, William...Tring
n, William...Devizes (North Wilts Foundry)
wn, William....Richmond Hill, Liverpool
n, Wm....Wirswall, Whitchurch, Salop
n, W. J....Hazlebury House, Chippenham
n, Wm....Kenton Lodge, Kenton, Northumb.
wne, Lord John Thomas...Wesport, co. Mayo
ne, Edward...Oaklands, St. Alban's
ne, R. P....Gt. Hallingbury, Bishops Stortford
ne, Robt. Palmer...Greenwich, S.E.
ne, Rev. T. C....59, High Street, Oxford
ne, Samuel...Brockton, Shiffnal
ne, Thos. Beale..Salperton Park, Andoversford
ne, T. B...MellingtonHl., Churchstoke, Shrewsb.
ne, W..Monkton Farleigh Ho. Bradford, Wilts
ne, William...Titchwell, Lynn
ning, A. H....Chalvey Court, Slough
ning, F....La Patrimoine, St. Lawrens, Jersey
ning, James T....Oxford
ning, S...Joint Counties Asylum, Abergavenny
wnlow, Earl...Ashridge, Berkhampstead
e, Maj. C. L. C., M.P....Dunphail, Forres, N.B.
e, John...Tiddington, Stratford-on-Avon
sdon, Benjamin...Ross
n, Frederick Thos....Humberstone, Leicester
n, John...Southleigh, Witney
ner, John...1, Belvedere, Weymouth
b, Anthony....Witcombe Court, Gloucester
anan, David...The Lodge, Clifton, Rugby
k, Albert...Sansome Terrace, Worcester
kingham, Duke of...Wootten, Aylesbury
land, George...Benenden, Cranbrook, Kent
land, J. Avery...Benenden, Cranbrook, Kent
land, Thomas, jun....Wraysbury, Staines
le, John...Uckington, Cheltenham
ley, Gen. E. P., M.P....New Hall, Salisbury
ley, Jas...Penyfai Ho., Llanelly, Caermarthens.
ley, John N...Normanton Hill, Loughborough
man, Professor...Bradford Abbas, Sherborne
worth, T. R....Cockley Cley Hall, Swaffham
d, J. Palmer...Ystalyfera, Swansea

Budd, William...Aston-le-Walls, Daventry
†Budd, Thos. W....13, Norfolk Cres., Hyde Pk., W.
Buddicom, Wm. B....Penbedw Hall, Mold
Bugg, Walter...Milborne Wick, Sherborne
Buggins, W....Booth's Farm, New Oscott, Birming.
†Bulford, James...Hordley Farm, Woodstock
†Bulkeley, Sir R. W., Bt., M.P...Baron Hill, Beaumaris
Bull, Alban...Hanwell, Banbury
Bulled, Edmund...Witheridge, Devonshire
Bullen, E...Irish Farmers' Cl., Sackville St., Dublin
†Bullen, John T....Marshwood Manor, Crewkerne
Buller, Sir A., Bart.....Pound, Plymouth
Buller, James Wentworth, M.P....Downes, Crediton
†Buller, Morton Edward...Dilhorn, Cheadle
Bullerwell, George...Fellside, Gateshead
Bullimore, R....Stowgate Farm, Market Deeping
†Bullock, F....Woodlands Hall, Eling, Southampton
†Bullock, George...East Coker, Somerset
Bullock, Walter...Foulkbourn Hall, Witham
Bulmer, Charles...Holmer, Hereford
Bulmer, Charles...Saltwell, Gateshead
Bulmer, Jeff., jun....Middleton-on-Row, Darlington
†Bult, James S....Dodhill Ho., Kingston, Taunton
Bult, Samuel J....Great Abshot, Titchfield
Bulwer, Rev. James...Hanworth Rectory, Thetford
Bulwer, Wm. Lytton...Heydon Hall, Reepham
Bunbury, Henry M....Marlston House, Newbury
Bundock, Alex. F....22A, Connaught Square, W.
Bunning, J. W....Newcastle-on-Tyne
Bunny, Capt. Edward John...Slinfold, Horsham
†Bunsen, G....Bourg-Rheindorf, Bonn, Prussia
Burbery, J. J....Crofts, Alveston, Stratford-on-Avon
†Burdett, E....Manor Farm, Lyvedon, Thrapstone
Burden, R...Castle Eden, Stockton-on-Tees
Burdon, George...Heddon Ho., Newcastle-on-Tyne
Burgess, Capt. H. W....3, Lancaster Terrace, N.W.
Burgess, Robt....Winterbourne, Zelston, Blandford
Burgess, William...95, Newgate Street, E.C.
Burgoyne, Sir J. M., Bt...Sutton Park, Potton, Beds
Burkill, E. W....Winteringham, Barton-on-Humber
Burleigh, Robert W....Halesworth
Burn, Robert Scott...Stockport
Burn, William...Broomhill, Acklington
Burnard, Chas. F....Compton Villa, Plymouth
Burnell, Edward...Roydon, Diss
Burnell, E. P....Winkburne Hall, Southwell, Notts
Burness, W...2, South Place, Acre Lane, Brixton, S.
Burnett, David...Ashley, Stockbridge, Hants
†Burnett, Francis...Kingscote, Wotton-under-Edge
Burnett, G. H...High Hedgefield, Blaydon-on-Tyne
Burnett, Gregory...Dee Cottage, Flint
Burnett, Thomas....Hutton, Preston, Lancashire
†Burniston, Rich....Greenlands, Henley-on-Thames
Burnup, Cuthbert...Newcastle-on-Tyne
Burnup, J. M....Newcastle-on-Tyne
†Burr, Daniel Higford...23, Eaton Place, S.W.
Burrard, Sir George, Bt...Walhampton, Lymington
†Burrell, Charles...Thetford
Burrell, J....3, High Swinburne Pl., Newc.-on-Tyne
Burrell, Robert...Palace Green, Durham
Burroughes, H. N...Burlingham Hall, Norwich
Burroughes, Rev. J....Lingwood Lodge, Norwich
Burroughes, Rev. T....Gazeley, Newmarket

Burroughes, William...Coltesball Hall, Norwich
Burrows, Richard...Ruddington, Notts
Burrows, T. Ash...Normanton-on-Trent, Newark
Burt, Edwin...Charlton House, Wraxall, Bristol
Burt, Henry...6, St. Mark's Sq., Regent's Pk., N.W.
Burton, R. H. L....Chilton Grove, Shrewsbury
Burtt, J. B....Kettering
Bury, Charles...Nazing, Essex
Busby, Henry Goodear...Moreton-in-the-Marsh
Bush, J. A.....Grainger Villa, Newcastle-on-Tyne
†Bush, John W....
Bush, R. Hilhouse...Litfield Ho., Clifton, Bristol
†Bushby, Henry Jeffreys...40, Chester Square, S.W.
Bushell, William...Poulton, Wingham, Kent
Busk, E. Thos...Ford's Grove, Edmonton, N.
†Busk, Joseph...Codicote Lodge, Welwyn
Butcher, W....Bowling Green Farm, Ewell
†Butler, Hon. C. L...Coton House, Rugby
Butler, Capt. G. C....Stanford Place, Faringdon
Butler, Capt. J....Kirby Ho., Inkpen, Hungerford
Butler, Lieut.-Col....Liphook
†Butler, Paul...Down Ampney Ho., Cricklade, Wilts
†Butler, Wm....Badminton, Chippenham
Butt, Henry...Westmancote, Tewkesbury
Butt, T....Pirton Farm, Kempsey, Worcestershire
Button, William...Botley, Oxford
Buxton, W....Lime Tree Lodge, Rotherhithe, S.E.
Byrd, David...Milford, Stafford
Byrd, Sampson...The Leese Farm, Stafford
Bywater, R. F....Coniston, Ambleside

C.

Cabrera, Gen. (Ct. de Morella)...Wentworth, Chertsey
Cadle, Clement...Ballingham Hall, Ross
Cadle, John...Much Birch, Ross
Cadle, Thomas...Longcroft, Westbury-on-Severn
Cadogan, Mrs....Brenkburn Priory, Morpeth
Cafferata, William...Newark, Nottingham
Caffin, Peter...Worth, Sussex
Cail, Richard...Fell Cottage, Gateshead
Caines, James...Cheselborne, Dorchester, Dorset
Caird, Jas., M.P....Baldoon, Newton Stewart, N.B.
†Calcraft, J. H., M.P....Kempstone, Corfe Castle
Caldecott, C. M....Holbrook Grange, Rugby
†Caldecott, Thos...Rugby Lodge, Rugby
Caldwell, Bonham...Leominster
Caldwell, H. B.....Lackham House, Chippenham
Caldwell, John...Inworth, Kelvedon
†Caless, Wm....Bodicote House, Banbury
†Call, Sir W. B., Bart....Whitford Ho., Callington
†Calthorpe, Hon. F. H. W. G., M.P...Perry Hall, Staffs.
†Calverley, Chas. C....61, York Place, Edinburgh
Calverley, John...Oulton Hall, Leeds
†Calvert, Frederic...9, St. James's Place, S.W.
†Calvertt, J. S...Tothill Manor House, Alford, Linc.
Cambridge, W. C....Sydney Villa, Bedminster
Camden, Marquis, K.G...Wilderness Pk, Seven Oaks
Cammell, Chas....Norton Hall, Derbyshire
†Cameron, A. H. F....Lakefield, Glen Urquhart
Camp, James...Ilfracombe
Campain, Joseph George...Cowbit, Spalding
Campain, S., jun....Deeping St. Nicholas, Spalding
Campo, J. W. del...3, Knightsbridge, S.W.
Campbell, A....Auchindadroche, Lochgilphead
Campbell, Sir A. T. C., Bart....
Campbell, Charles Lee, Thurstaston Hall, Birkenhead
Campbell, R....Buscot Park, Lechlade
Campion, Wm. J....Dannys, Hurstpierpoint
Camps, Henry...Salterley Grange, Cheltenham
Camps, Wm....40, Park St., Grosvenor Square, W.
Cane, Edward...Berwick, Lewes
Cane, Rev. T. C....Southwell
Cann, W. M....Dawlish, Devon
Canning, George H...Shottery, Stratford-on-Avon
Canning, Wm. Browne...Elston, Devizes
Cannon, Joseph Sims...Beckley, Oxford
Cantrell, Charles Seward...Riding Court, Datchet
Cantrell, H....Baylis Court, Slough
†Capel, Arthur...Bulland Lodge, Wiveliscombe
Capel, Wm....The Grove, Stroud, Gloucestershire
Capper, R. Harcourt...N. Gate, St. Leonard's, Re
†Carew, R. Russell...Carpenders Park, Watford
†Carew, Thomas...Collipriest House, Tiverton
†Carew, W. H. Pole...Antony House, Devonport
Cardus, T....Barwell Court, Kingston, Surrey, S.W.
†Cardwell, E. H....11, Cromwell Place, W.
Carey, Arthur....Oak Hall, Wanstead, N.E.
Cargey, George...Osmaston Manor, Derby.
Cargey, Gilbert...Kiplin, Catterick
Carius, George...Heaton, Newcastle-on-Tyne
†Carleton, Hon. and Rev. R....24, Grosvenor Place
†Carline, R....Lincoln
Carlin, Wm., jun....Marsh Cott., Keyingham, Hull
†Carnegie, David...Eastbury, Watford
Carnegie, Hon. J. J....Fair Oak, Petersfield
Carr, John...Roseworth, Newcastle
Carr, Rd. Storer...St. James St., Newcastle-on-Tyne
Carr, William...Stackhouse, Settle
Carr, W. R....Scotswood, Blaydon-on-Tyne
Carrick, William, jun....Tarn Lodge, Carlisle
†Carrington, T. S. Townsend..Eaton Dovedale, Derby
Carrington, William T....Hollington, Uttoxeter
Carroll, W. Hutchinson...Tulla House, Nenagh
Carter, G....Tyndales, Danbury, Chelmsford
†Carter, John Bonham, M.P....Adhurst St. Mary's
Carter, J. R....Lanark Villa, Torquay
Carter, M. F....Newnham, Gloucester
Carter, Richard H....Hullington, Chippenham
Carter, R. M....Leeds
Carter, William...Boughton Blean, Faversham
†Cartwright, Col. H., M.P....Kineton, Warwick
Cartwright, G. K....14, Upper Seymour St. West, W.
Cartwright, John...Craycombe House, Pershore
Cartwright, John...Shrewsbury
Cartwright, Nathaniel...Haugham, Louth
Cartwright, Richard Aubrey...Edgcott, Banbury
Cartwright, T. R. B...Aynhoe, Brackley, Northamp
†Cartwright, T. W...Ragnall Hall, Newton, Newark
Cartwright, Col. W....Weedon
†Cartwright, Wm. George...Newport, Monmouthshire
Cartwright, W. S...Stow Ho., Newport, Mon.
Carver, William...Ingarsby, Leicester
†Case, J. B...Poulton Hey, Bebbington, Birkenhead
Case, Thomas H....Testerton Hall, Fakenham

llain, Alfred...Liverpool
se, Josiah...College Green, Gloucester
pool, Edward...Feering Bury, Kelvedon
, J. W....West Lodge, Barnet, N.
seart, Earl...Thornton-le-Street, Thirsk
art, Sir John A., Bart....
seart, R...Pitcairlie Ho., Auchtermuchty, Fifes.
, Maj.-Gen. (R.H.A.)..Arsenal, Woolwich, S.E.
r, Rev. T....Wentbridge House, Pontefract
ey, Rev. Richard...Worcester
lfield, J. Molyneux, Lt.-Cl...Moy, co. Tyrone
lfield, St. George...Donamor Cas., Roscommon
ton, John T....Lighthorn, Warwick
ton, Joseph...Champion Hill, Camberwell, S.
n, Col. P. C. Longparish, Whitchurch, Hants
, Henry Haddon...Desborough, Kettering
endish, Hon. Capt. G., R.N....Chertsey
ndish, Ld. G.H., M.P...3, Up.Eccleston St., S.W.
ndish, Lt.-Col. W. H. F...Ayot St. L., Welwyn
dor, Earl of...Stackpole Court, Pembroke
ley, Thomas...Nantwich
ton, Wm....Somersall Hall, Chesterfield
ley, Sir Digby, Bart....Brompton, York
let, Rev. W. W....Pinner
lwick, Edward...
lwick, E., C.B....5, MontagueVil.Richmond, Sur.
adwick, Elias...Pudleston Court, Leominster
adwick, F....The Hermitage, Grimsargh, Preston
lwick, Joseph...Kirkstall, Leeds
lwick, T....Wilmslow Grange, Cheshire
lwick, William...Burlish Lodge, Stourport
afy, Westwood W....Bowes House, Ongar
craft, Thomas...Millhall Cottage, Alton
craft, William...Bramshot House, Liphook
k, Thomas...Barbourne, Worcester
lenor, John...Blackwood, Leek
oner, Capt. Thos., R.N...Longhull, Guisboro.
nberlain, Henry, jun...Bredicot Court, Worcester
mberlayne, Thos....Cranbury Pk., Winchester
nbers, George...High Green House, Sheffield
nbers, John...The Hurst, Tibshall, Alfreton
nbers, Thomas, jun....Colkirk, Fakenham
mbers, Wm....Hafod, Rhayader
npion, Wm. W....Calcot, Reading
npney, Felix...Gatwick, Crawley, Sussex
npneys, Rev. T. P....Badsworth, Pontefract
dler, Henry...Salford, Manchester
dler, Thomas...Aldbourne, Hungerford
lin, Frederick...Taithwell, Louth
man, J. W....Moggaddy Farm, Maynooth
man, R. H....Upton, Nuneaton
man, Thos...23, New St., Spring Gardens, S.W.
man, William...1, Neale Street, Ipswich
rlesworth, J....Headfield, Dewsbury, Yorkshire
rley, Richard...Cleobury North, Bridgenorth
rlton, St. John...Hillfields, Bewdley
rlton, St. J. C...Apley Cas., Wellington, Salop
ton, Wm...BulmanVillage, Newcastle-on-Tyne
ton, W. H....Hesleyside, Hexham
more, Philip...Horsham
adler, Robert James...Crondall, Farnham
ner, Henry...Hound Hill, Uttoxeter
ner, Richard...Hare Hill, Doveridge, Derby]

†Chawner, Richard Croft...The Abnalls, Lichfield
Cheere, Rev. G....Papworth Hall, St. Ive's, Hunt
Cheere, W. H....Papworth Hall, Caxton, Cambridg
Cheffins, Henry...Little Easton Manor, Dunmow
Cheney, Edward....Gadsley Hall, Melton Mowbra
Cheney, R. H....Badger Hall, Shiffnal, Shropshire
†Cherry, Geo. Charles...Denford, Hungerford
†Chesham, Lord...Latimer, Chesham
Chesterfield, Countess of..Bretby Pk., Burton-on-T
Chetwode, Sir J. N. L., Bart....Market Drayton
Chetwynd, Sir G., Bart...Grendon Hall, Atherston
Chetwynde, Major W. F....Brocton Hall, Stafford
Chichester, Bishop of...The Palace, Chichester
Chick, John...Compton Vallence, Dorset
Chick, John...Whitwell, York
Chick, Thomas...Stratton, Dorchester, Dorset
Child, Coles...The Palace, Bromley, S.E.
Child, Thomas...Slinfold, Horsham
Chinery, John...Wootton Milton, Lymington
Chittenden, James...Hope All Saints, New Romne
Chittenden, John...Newchurch, New Romney
Chitty, Edward...Guildford
Chivas, George...Chester
†Cholmondeley, Lord H....Holly Hill, Southampto
Cholmondeley, Col. Hon. G...Abbott's Moss
Chrisp, Thomas..Hawkhill, Alnwick
Christian, John...Barrow House, Oakham
Christy, James, jun....Boynton Hall, Chelmsford
Church, John...Woodside, Hatfield
†Churchill, George...Aldershot, Fordingbridge
†Churchill, Lord...Wychwood Park, Oxon
Churchill, H....Barton Ho., Morchard Bishop, Devo
†Churston, Lord...Lupton, Torquay
†Churton, John...Foregate Street, Chester
Chute, W. L. Wiggett...The Vine, Basingstoke
Clare, Charles L....Higher Broughton, Manchester
Clare, W. Harcourt...Twycross, Atherstone
†Clarance, John...
Claridge, William P....The Parks, Loughborough
†Clarina, Lord...Elm Park, Limerick, Ireland
†Clark, H...Ellinthorpe Hall, Boroughbridge, Yorks
Clark, James...View Lawn, Longhorsly, Morpeth
Clark, Rev. John Crosby...Chertsey
Clark, John Wm....Belkins, Romsey, Hants
Clark, Joseph H....Attwood House, Maidenhead
Clark, Thomas...Derndale, Hereford
Clark, William...Hepscott Hall, Morpeth
Clark, William J....2, Royal Crescent, Brighton
†Clarke, C....Ashby-de-la-Lound, Sleaford, Linc.
Clarke, Edward...White Ho., Bracebridge, Lincoln
Clarke, Edw....Glebeland House, Lee, Kent
†Clarke, James...Carlisle
Clarke, G. R....Chesterton Lodge, Bicester
Clarke, Henry...Binbrooke, Market Rasen
Clarke, John...Long Sutton
Clarke, J. Goff...Brackley, Northampton
Clarke, Jno. William...Cambo, Newcastle-on-Tyne
Clarke, Nathaniel...Beamish Park, Fence Houses
Clarke, Robt. B....Haynes Hill, Barbadoes
†Clarke, T. E....Tremlett House, Wellington, Som.
Clarke, Thomas T....Swakeleys, Uxbridge
Clarke, William...Brack Farm, Luton
Clarke, W. B...Berwickstead, Beckermet, Whiteh-

Clarkson, Thos....Playford Hall, Ipswich
Clarkson, Rev. T. L....South Elmham, Norfolk
†Clavering, Sir W., Bt...Univ.Club,Suffolk St., S.W.
Clay, Charles...Walton Grange, Wakefield
Clay, Charles, Whitchurch, Salop
†Clay, Sir W., Bart....Fulwell Lodge, Twickenham
Clay, William D....St. Aston House, Lutterworth
Clayden, John...Littlebury, Saffron Walden
†Clayden, John C....Littlebury, Saffron Walden
Clayden, Samuel...Linton, Cambridgeshire
Clayton, David S....Norbury, Stockport
Clayton, H...21, Upper Park Place, Dorset Sq., N.W.
Clayton, John...Newcastle-on-Tyne
Clayton, John...Hook, Kingston, S.W.
†Clayton, Nathaniel...Melville Street, Lincoln
Clayton, R.C.B..Carigbyrne, Adamstouse, Enniscorthy
Clayton, T. G...Thorpe Arch Hall, Tadcaster
Cleasby, John H....High Heworth, Gateshead
Cleasby, R. H....Broomside House, Durham
Cleasby, Thomas M....Wilton Grange, Redcar
Cleave, Benjamin...Newcombe, Crediton
Clements, C. F....Hesmond's Lodge, East Hothly
†Clerk, E. H....Burford, Shepton Mallet, Somersets.
Cliffe, Thomas...Crew Gates, Crewe
Clifford, Henry Clifford...Frampton Court, Dursley
Clifford, Col. H. M....Llantilio, Cosseney, Ragland
Clifford, William...52, Parliament Street, S.W.
†Clinch, Charles...Eagle Brewery, Witney
Clinton, Charles H. Fynes...Whitefriars, E.C.
Clinton, Col. Fred....Ashley Clinton, Lymington
Clinton, Lord...Hinton House, Crediton, Devon
Clive, Hon. Capt. G. W., M.P...53, Grosvenor St., W.
Clive, George, M.P....Penistone, Ross, Herefords.
†Clonbrock, Lord...Clonbrock, Ahaserah, Ireland
Clough, John...Bootham, York
†Clowes, Edmund...Carnforth, Lancaster
Clowes, George...Duke Street, Stamford Street, S.
Clowes, Wm...51, Gloucester Ter., Hyde Park, W.
Clowes, Col. W. L. ...Broughton Old Hall, Manch.
Clutterbuck, Rev. J.C...Long Wittenham, Abingdon
Clutterbuck, R....Watford Ho., Watford, Herts
Clutterbuck, T...Warkworth, Acklington, Northumb.
Clutton, John... 9, Whitehall Place, S.W.
Clutton, Robert...Hartswood, Reigate, Surrey
Clutton, Robt. G....9, Whitehall Place, S.W.
Clutton, Wm....Portland Villa, S. Norwood
Clutton, Wm. James...The Mount, York
Cobb, Frederick...Walton, Warwick
Cobb, Geo. Henry...Greenwich
†Cobb, Henry...26, Lincoln's Inn Fields, W.C.
Cobb, Robert L....Higham, Rochester
Cobb, Thomas...Radnor Cliff Villa, Sandgate
Cobb, Timothy Rhodes...Banbury, Oxon
Cobb, William Henry...Colchester
Cobbett, John M., M.P....Skeynes, Edenbridge
Cobbold, John Chevallier, M.P....Ipswich
Cobden, Richard, M.P....Midhurst
Cobon, James...Well Hall, Lynn, Norfolk
†Cochrane, Archi. H....Langton Grange, Darlington
Cochrane, James...Harburn, Edinburgh
Cochrane, Wm....31, West Parade, Newcastle-on-T.
†Cocks, Rev. C. R. Somers...Cleobury Mortimer
Cocksedge, James...Stowmarket

Codd, Henry...Ashe, Micheldever
Cohen, Wm....Chestnuts, Figgs Marsh, Mitcham
†Coke, Hon. E. K....Longford Hall, Derby
Colby, S. E....Havod Grove, Cardigan
Coldham, H. W....Anmer, Lynn, Norfolk
†Cole, R. J...
Cole, Thomas H...The Green, Wick, Bath
Cole, Wentworth L...Cirencester
Coleman, John...South Fields, Wandsworth, S.W.
Coleman, John...Park Farm, Woburn, Beds
Coleman, Richard....Langdon Abbey, Dover
Coleman, Richard....Chelmsford
Coleman, Walter, Kingsbury Hall, Tamworth
†Coles, Alfred...Clifton Lodge, Clapham Park, S.
Collier, W. F....Woodtown, Tavistock
Collin, Rev. J., jun....Rickling Vicarage, Herts
Collings, Rev. William T....Guernsey
Collingwood, E...Dissington Hall, Newc.-on-Tyne
Collins, Barnabas...Hunston, Ixworth
†Collins, Henry...38, Lincoln's Inn Fields, W.C.
†Collins, John...Wonham, Bampton, Devon
Collins, Wm....Aston Farm, Stafford
Collison, William...Beverley
Collyer, Rev. Canon R...Warham Rect., Wells, Norf
Colquhoun, J. C....Chartwell, Westerham
†Colyer, William...North End, Crayford, Kent
Colthurst, John...Chew Magna, Bristol
Colthurst, J. C....Huntworth Pk. Farm, Bridgwater
Colvile, Rev. A. A...Livermere Rectory, Bury St. Ed
Colvile, Lieut.-Gen...Kempsey House, Worcester
Colvile, C. R., M.P...Lullington Hl., Burton-on-T
†Colvin, B. B...Monkhams Ho., Waltham Abbey,
Combe, R. H....Pierrepoint, Frensham, Farnham
Combermere, Visc...Combermere Abbey, Nantwich
†Compton, H. C., M.P....Lyndhurst, Hants
†Compton, R....Eddington House, Hungerford
†Condie, James...Perth
Coney, William...Battenhall, Worcester
†Congreve, S. B....Harbors Magna, Rugby
†Congreve, T....Leamington Hastings, Rugby
†Congreve, W....Comb Fields, Brinklow, Coventry
Conington, Clement...Hagworthingham, Spilsby
†Constable, Sir Clifford, Bt...Burton Constable, Hu
Constable, Rev. J....R. A. College, Cirencester
Conway, Wm. S....Bodryddan, St. Asaph's, Flintsh
Cooch, Joshua...Harleston, Northampton
Cook, George...Flitwick, Ampthill
Cook, George...22, Aberdeen Park, Highbury, N.
†Cook, John...Hothorpe, Welford, Northamptonsh
Cook, Richard Samuel...Pailton Lodge, Lutterworth
Cook, William...Hexham
Cooke, B. G. D....Colomendy, Mold
Cooke, Grimwood....Linton, Cambridgeshire
†Cooke, Henry...High Street, Hereford
Cooke, James H....Berkeley Castle, Gloucestershi
Cooke, Rev. James Y....Semer, Ipswich
Cooke, Robert C....Livermere, Bury St. Edmund
Cooke, William, C.E....
Cooke, William...Stanford, Worcester
†Cooke, Wm. Fothergill...
Cookes, Jno. R....Woodhampton House, Stourpor
Cookson, John...Meldon Park, Morpeth
Cookson, G. J...Benwell Tower, Newcastle-on-Ty

Cookson, N. C...Benwell Tower, Newcastle-on-Tyne
Cookson, W. J...Benwell Tower, Newcastle-on-Tyne
Coombs, T....South Street, Dorchester, Dorset
Cooper, Benjamin...Pattingham, Wolverhampton
†Cooper, C. B....The Manor, Micheldever, Hants
Cooper, Edward...Henley-in-Arden
Cooper, Edwd. H...Markree Castle, Collooney, Sligo
Cooper, G. Kersey...Euston, Thetford
Cooper, Henry Reeve...Britwell, Watlington, Oxon.
Cooper, John...Swineshead House, Spalding
Cooper, Jonathan...Barton, Bury St. Edmund's
Cooper, Joseph...Redmarley, Newent
†Cooper, N. J....Westgate, Mansfield
Cooper, Rous John...Blythburgh Lodge, Halesworth
Cooper, W. W....Barnham, Thetford
Coote, George...Smeetham Hall, Sudbury
†Coote, E. (11th Hussars)..West Pk., Fordingbridge
Coote, Geo. Cosens...Tortington, Arundel
Copeman, George...Dunham Lodge, Swaffham
Copeman, Robert, jun....Hemsley, Great Yarmouth
Copestake, Thos. G....Kirk Langley, Derby
†Coppard, T....Lanehurst Lodge, Hurstpierpoint
Corbet, H....Central Farmers' Club
†Corbet, H. R....Adderley Hall, Market Drayton
Corbett, James...Croome Dabitop, Severn Stoke
†Corderoy, Edward...Clapham Park, S.
Corles, Edward...The College Green, Worcester
Corner, Edward...Esk Hall, Whitby
Corner, J. B....Longforth, Wellington, Somerset
Corner, Richard...Torweston, Williton, Taunton
Cornes, James...Barbridge, Nantwich
Cornewall, Sir V., Bart....Moccas Court, Hereford
Corringham, R. W....Lound House, Haxey, Bawtry
Coryton, Augustus...Pentillie Castle, Cornwall
Cosens, William...Langdon, Dawlish, Devon
Cotes, Rev. C. G...Stanton St. Quintin, Chippenham
Cother, William...Middle Aston, Woodstock
Cottam, George H....Old St. Pancras Road, N.W.
Cotterell, Sir H. G. Bart....Garnons, Hereford
†Cotterell, Jacob Henry...6, Terrace Walks, Bath
Cottingham, John G....Chatsworth, Chesterfield,
†Cotton, Alexander...
Cotton, H....Amor Hall, Washbrook, Ipswich
Cotton, H. P....Quex Park, Isle of Thanet
Cotton, Maj.-Gen. T. Conyers...Cilhendre, Ruabon
†Cotton, Lt.-Col. Hon. W. H. S....Malpas, Cheshire
†Couchman, C....Temple, Balsall, Birmingham
Couchman, J. W....Tottenham Green, N.
Coulman, Edward...The Levels, Thorne, Yorkshire
Coulman, John...Red House, Thorne
Coulson, John...Killingworth, Newcastle-on-Tyne
Coulson, Robert C....Burnigill House, Durham
Coultas, James, jun....Spittlegate, Grantham
†Coulthard, G....Lanercost Abbey, Brampton, Cum.
Coupland, John G....Freeston, Boston
†Court, P. Simpson...140, Snargate Street, Dover
Courthope, G. C....Whiligh, Hurst Green
Coussmaker, Lannoy...Westwood, Farnham, Surrey
Coventry, Earl of...Croome Court, Kempsey
Coverdale, John...4, Bedford Row, W.C.
Cowen, Joseph...Stella Hall, Blaydon-on-Tyne
Cowen, J. jun....Stella House, Blaydon-on-Tyne
†Cox, Henry...Treveraux, Edenbridge, Kent
Cox, Joseph...Wisbeach
Cox, Samuel Walker...Spondon Cottage, Derby
Cox, William...Brailsford, Derby
Cox, Wm. Thos....Spondon Hall, Derby
†Coxe, James...Newtown Lodge, Hungerford
Coxon, John...Treeford Farm, Lichfield
Coyney, C....Weston Coyney, Longton, Staffordsh.
Crane, Edward...Forton, Montford, Shrewsbury
Crane, James...Tolpuddle, Dorchester
Crane, James...Shrawardine, Salop
Cranke, John...Fountain Street. Ulverstone
†Cranston, Thomas...Little Dilwyn, Leominster
Crawford, John...Lumley Park, Fence Houses
Crawford, Thomas...North Shields
Crawford, Rev. W. H....Haughley Park, Woolpit
Crawford, Wm. H....Lakelands, Cork
†Crawley, John S....Stockwood Park, Luton
Crawshall, Isaac...Nun Monkton, York
†Crawshay, Edwd...Orthorpe Ho., Market Harboro'
Creese, William...Teddington, Tewkesbury
Cressingham, Jonah...Carshalton, S.
Cresswell, A. J. Baker...Cresswell, Morpeth
Cresswell, Gerard O....Sedgeford Hall, King's Lynn
Cresswell, R. W....Ravenstone, Ashby-de-la-Zouch
Crewe, Sir J. H., Bart....Calke Abbey, Derby
Crisp, Arthur William..Gedgrave Hall, Woodbridge
Crisp, Edward, M.D....42, Beaufort Street, S.W.
†Crisp, Thomas...Butley Abbey, Wickham Market
†Croft, Arthur H....Hutton Buscell, York
Croft, Rev. Archdeacon J....Saltwood, Hythe, Kent
†Croft, Sir John, Bart....Kingsdown, Sittingbourne
†Crofton, Lord...Mote Park, Athlone, Ireland
†Crofts, Rev. C. D....Caythorpe Rectory, Grantham
Crofts, John...Long Lawford Hill, Rugby
Crofts, T. W....Stoneleigh Terrace, Coventry
Crompton, George...Chesterfield
Croome, James...Breadstone, Berkeley, Gloucesters.
Croome, J. Capel...Cerney House, Cirencester
Croote, G. H...Crooke, North Tawton, Devon
Crosbie, Wm. T....Ardfert Abbey, Tralee, Ireland
†Cross, Wm. A....Red Scarr, Preston, Lancashire
Crosse, Thomas B....Shaw Hill, Chorley
Crosskey, John...Lewes
Crosskill, Alfred...The Iron Works, Beverley
†Crossley, Sir F., Bt., M.P...Somerleyton, Lowestoft
Crosthwaite, John...
†Crow, G....Ornhams, Boroughbridge, Yorkshire
Crowley, John L....Standford Hall, Newport, Salop
Croxon, John...Llanoorda Isaf, Oswestry
†Crump, G. W...Woollas Hill, Eckington, Pershore
Crump, Thomas...Whitefield, Tewkesbury
Crundwell, George...14, Ashford Road, Maidstone
Cruso, John...Leek, Staffordshire
Crutchley, P. H....Sunninghill Park, Staines
Cuff, J. H....New Cattle Market, Islington, N.
†Cuff, W. Fitchett...Merriott, Ilminster
Culley, John...Easton, Pewsey, Wilts
Culverwell, Jas....Wedmore, Weston-super-Mare
Cumberbatch, L....Queen's House, Lyndhurst
†Cumming, L....Ratten, Thurso, N.B.
Cunningham, Capt. R. D. B...Hensol, Castle Douglas
Cuninghame, John...Hensol, Castle Douglas, N.B.
†Cure, Capel...Blake Hall, Ongar, Essex

Cureton, George...Bean House, Shrewsbury
Currie, Edmund...Adbury House, Newbury
Currie, Henry...West Horsley Park, Leatherhead
Currie, Raikes...Minley Manor, Farnboro'
Currie, Wm. Pitt...Gt. Vaynor, Narberth, Pembroke
Curtis, Capt. C....Pailton House, Lutterworth
Curtis, Charles E....Alton
Curtis, E....Dummer Grange, Basingstoke
Curtis, Frederick Thos...Elmstone Court, Sandwich
Curtis, Thomas...The Hall, Berkhamstead
†Curtis, Sir Wm., Bart....Caynham Court, Ludlow
Curtler, T. G....Bevere House, Worcester
Curzon, Hon. S. C. H. R....Grove Ho., Tooting, S.
Cust, Capt. F. Henry...Ellesmere
Custance, Hambleton F....Weston House, Norwich
Cuthbert, Robert...Newton-le-Willows, Bedale
†Cuthbert, William...Beaufront, Hexham
Cutting, Robert Coote...Ridlington Uppingham

D.

Dacre, Lord...The Hoo, Welwyn, Herts
†Dacre, Joseph...Kirklinton Hall, Carlisle
Dalgairns, William...Rosaire, Guernsey
Dalton, James...Fillingham Manor, Lincoln
Dalton, Thomas...Cardiff
Danger, Thomas...Huntstile, Bridgewater
Daniel, Charles R....Clayworth, Bawtry
Daniel, Thomas...Stoodley, Tiverton
†Darbishire, S. D....Pendyffryn, Conway
Darby, George...Marklye, Warbleton, Hurst Green
†Darby, Abraham...Stoke Court, Slough
†Dare, F. M. Hall...
Dare, R. W. Hall...Newtownbarry, Ireland
Darley, Chas. Albert...Burtonfield, York
†Darling, J....Beau Desert, Rugeley
Darling, Robt....Plawsworth, Fence Houses
Darnbrough, Thos. S....South Otterington, Thirsk
Darvill, Henry...Windsor
†Dashwood, F. Loftus...Kirtlington Park, Oxon
Dashwood, Sir Henry W., Bt....Kirtlington, Oxford
†Dashwood, M....9, Seamore Place, Mayfair, W.
Daubeny, Edmund J...Cleve House, Yatton, Somers.
Daubeny, Rev. E. A....Ampney, Cirencester
Daubeny, R....King's Bench Walk, Temple, E.C.
Davey, George...Buckland, Faringdon
Davey, Richard, M.P....Redruth, Cornwall
David, Edward...Fairwater House, Cardiff
David, Evan William...Radyr Court, Cardiff
Davidson, James...125, High Street, Gateshead
Davie, Sir H. Ferguson, Bt., M.P...Creedy, Crediton
Davie, J. Thornton...Hepscott Red House, Morpeth
Davies, D. Price...Troedybryn, Llandilo
Davies, D. R....Mere Old Hall, Knutsford
Davies, E. H....Hampton Bishop, Hereford
Davies, Rev. J....Moor Court, Herefordshire
Davies, John Morgan, Froodvale, Llandillo
Davies, Rev. R. T....Crickhowell, Brecknockshire
Davies, Richard...Aylestone Hill, Hereford
Davies, Robert C....Southminster, Maldon
Davies, Robert J., Cwrtmaur, Llangeitho, Cardigan
†Davies, Robt. P....Ridgeway, Narberth, S. W
Davies, Mrs. Susanna...Rochlaveston Manor,
Davies, Thomas...Burlton Court, Burghill, He
Davies, Rev. W. I. K....Croft Castle, Leomin
Davis, Henry...Old Downs, Oakhill, Bath
Davis, James...Melcombe Horsey, Blandford
†Davis, John...Cranbrooke, Ilford, E.
Davis, Peter...Bickmarsh Hall, Alcester
†Davis, R....9, St. Helen's Place, Bishopsgat
†Davis, R. F....
†Davis, R. S. B....Swerford Park, Enstone, O
†Davis, Samuel...Swerford Park, Enstone, O
†Davis, Thos. Henry...Orleton, Worcester
Davis, T....Little Wenlock, Wellington, Shro
Davison, John...Tritlington, Morpeth
Davison, John, jun....Tritlington, Morpeth
Davison, Robert S....Newburn, Blaydon-on-T
Davison, John Perry...Easton Maudit, Northa
Davison, Richard...Driffield
Davison, Michael...Long Bank, Alnwick
Davison, Joseph...Greencroft, Durham
Davey, Jas....Flitton-Barton, South Molton
†Davey, J. S....Redruth, Cornwall
Davey, Robert...Ringwood, Hampshire
Davy, John T....Barton Roseash, South Molt
Dawes, John S....Smethwick House, Birming
Dawkins, E. H. F....Moggerhanger Ho., St.
Dawson, Edward...Aldcliffe Hall, Lancaster
Dawson, J....Gronant, Rhyl, Flintshire, N.W
†Dawson, Wm. Edward..Plumstead Common
†Day, Charles...Colleyweston, Stamford
Day, John...Newick Lodge, Uckfield
Day, Samuel...St. Neot's
†Day, William...Woodyates, Salisbury
†Deacon, John...Mabledon, Tonbridge
†Dean, A. K....East Brent, Axbridge, Some
†Dean, F. K....East Brent, Axbridge, Somer
Deane, F. H....Eastcot, Ruislip, Watford
Deane, Rev. Henry...Gillingham, Dorset
Deane, William Anthony...Webbery Ho., B
Dearden, James...Poole
Death, Ambrose...Lawshall, Suffolk
†De Curzay, Visct...Château de Curzay, Lusi
Deedes, Major G....Hillhurst Farm, Hythe
Deedes, William...Sandling Park, Hythe
†Dees, James...Whitehaven
†Dees, Robert R....Wallsend Hall, Newcastl
De L'Isle and Dudley, Lord...Penshurst Park
Delves, William...Frant, Tonbridge Wells
De Mauley, Lord...Down Ampney, Cirences
†Demidoff, Prince...Florence
†Denbigh, Earl of...Newnham Paddock, Lutte
Denchfield, J....Aston Abbotts, Aylesbury
Denison, Edmund...Doncaster
†Denison, Sir W., Bart....New South Wales
Denison, W. Beckett...Burley, Leeds
Denman, Lord...Middleton Hall, Bakewell
Denne, Wm....Three Counties Asylum, Bald
†Dennett, Mullens...Lodsworth, Petworth, S
Dennis, John Chas....Rosebrough, Northumb
Dennis, Robert...Greetham, Horncastle
Denson, Samuel...Picton Hall, Cheshire
†Dent, John Coucher...Sudely Castle, Winch

Dent, John D., M.P....Ribstone Hall, Wetherby
Dent, Joseph...Ribstone Hall, Wetherby
Dent, Joseph...Neasham Hall Farm, Darlington
Dent, Ralph...Streatlam Castle, Barnard Castle
†Dent, Wilkinson..Flass Ho., Kirkby Thore, Penrith
Denton, A. Bailey....Stevenage, Hertford
De Rothschild, Sir A., Bt....Aston Clinton, Tring
Derry, C. E....Farmers' Club, Newcastle-on-Tyne
De Salis, Rev. H. J....Fringford Rectory, Bicester
Dester, Wm...Seckington, Tamworth
†De Trafford, Sir H., Bt. ..Trafford Pk., Manchester
Devas, Charles F....Bromley Lodge, Kent, S.E.
Devas, Thomas....Mount Ararat, Wimbledon, S.W.
Devas, William...Woodside, Old Windsor
Deverell, John...Purbrook Park, Portsmouth
Devincenzi, Signor Giuseppe...
Des Vœux, Sir H., Bt....Drakelow Pk., Burton-on-Tr.
†De Vitre, H. D....Charlton House, Wantage
†Devon, Earl of...Powderham Castle, Exeter
Devon, Chas..St. Vincent's, Haddington, Maidstone
Dew, Tomkyns...Whitney Court, Hereford
Dewar, William...Middleton, Bicester
Dewe, Wm. T....Manor House, Coates, Cirencester
†De Wezele, Count G....55, Eaton Square, S.W.
†Dewing, R....Carbrooke, Watton, Norfolk
De Winton, J. P....
Deykin, James, jun....Whiston, Penkridge
Diamond, James....Beer Alston, Tavistock
†Dickens, Charles Scrace...Horsham
Dickin, John...Tyndwfr, Langollen
Dickin, Richard....161, Old Road, Stockport, Lanc.
Dickinson, W. F. D....Ulverston, Lancashire
Dickins, R. A...Woodford Grange, Wolverhampton
Dickinson, H....Severn Ho., Colebrookdale, Salop
†Dickinson, E. H....King's Weston, Somerton
Dickinson, John...Abbott's Hill, Watford, Herts
Dickinson, William...New Park, Lymington
†Dickons, Thomas...High Oakham, Mansfield
Dickson, Arthur....Queen's Park, Chester
Dickson, James...Chester
Digby, G. D. Wingfield...Sherborne Castle, Dorset
Digby, Lord...Minterne House, Dorchester, Dorset
Digby, Rev. K...Tetteshall Rectory, Litcham, Norf.
Digby, Lt.-Col. R...6, Chapel St., Grosvenor Sq., W.
Dilke, Sir C. Wentworth, Bt....76, Sloane St., S.W.
†Dilke, Charles W....76, Sloane Street, S.W.
†Dillon, Viscount...Dytchley Hall, Enstone, Oxon
†Dinning, J...Adderstone, Belford, Northumberland
Dinning Joseph...Langley Hill Top, Haydon Bdge.
Disney, Edgar...The Hyde, Ingatestone
Disraeli, Rt.Hn. B., M.P...Hughenden Man., Bucks
Divett, John...Bovey Tracey, Devon
Dix, George Weatherstone...Howden, Yorkshire
Dixie, E. W....Wenhaston Grange Halesworth
†Dixon, George M....Bucknowle House, Wareham
Dixon, Henry...Frankham, Tunbridge Wells
Dixon, Henry Hall...10, Kensington Square, W.
Dixon, Hugh...5, India Buildings, Liverpool
Dixon, Isaiah...Grove Terrace, Leeds
Dixon, John...Harmston, Lincoln
Dixon, J. T....Dunterley, Bellingham, Hexham
†Dixon, John W....Caistor, Lincolnshire
Dixon, Peter...Holme Eden, Carlisle
Dixon, Thos. John...Holton, Caistor, Lincolnshire
†Dixon, Thos. Parkinson...Caistor, Lincolnshire
Dixon, Wm. F....Page Hall, Sheffield
Dobinson, Francis...Wilderwick Ho., E. Grimstead
Dobito, George...Lidgate, Cropley Gro., Newmarket
Docker, Ludford...Paul's Hill, Leigh, Tunbridge
†Dod, Whitehall...Llannerch, St. Asaph
Dod, J. W., M.P...Cloverley Hall, Whitchurch, Salop
Dodd, Henry....The Riding, Hexham
Dodds, P. A....Howard Street, North Shields
Dods, T. P....Anick Grange, Hexham
†Dodson, Charles E....Littledale Hall, Lancaster
Dodwell, J....Manor House, Long Crendon, Thame
Doggett, Thomas William...Sandon, Royston
Dolphin, T....Swafield, North Walsham, Norfolk
Donald, Adam...Grainger St., Newcastle-on-Tyne
Donald, W....St. James's Hall, Regent Street, W.
†Doneraile, Viscount...Doneraile Court, Co. Cork
Donkin, David....St. James' St., Newcastle-on-Tyne
Donkin, Robert...Felton, Acklington, Northumber.
Donkin, Samuel...Bywell, Felton, Northumberland
†Donovan, George (49th Regt.)...
Donovan, J. C....Gatwick, Mill Hill, Billericay
Dorrell, Thomas...Bishampton, Pershore
Dorrington, C....Bridehall Farm, St. Albans
Dormer, C. Cottrill...Rousham, Woodstock, Oxon
†Dorrien, C....Ashdean, Funtingdon, Chichester
Doubleday, E....Long Clawton, Melton Mowbray
Douglas, James...Athelstaneford, Drem, N.B.
Dowden, Thomas...Roke Farm, Bere Regis
†Dowdeswell, G. M...Park Gate Ho., Catsfield, Battle
Dowding, Edwyn...15, Vineyards, Bath
Downing, J. B....Holme Lacey, Hereford
Downing, William...Lemington, Blaydon on-Tyne
Downs, Henry...Manor House, Basingstoke
Downs, J. H....Grove Lodge, Fulham, S.W.
Downward, Rev. George R....Shrewsbury
Downward, John...Hampton Hall, Malpas
Drake, Sir T. T. F. E., Bart...Nutwell Court, Exeter
†Drake, T. Tyrwhitt...Shardloes, Amersham
Drakeford, David...Dillions, Crawley, Sussex
Draper, Charles....Kenilworth
Draper, J. S....Thingehill, Hereford
†Drax, J.S.W. Erle, M.P...CharboroughPk. Blandford
Dray, William...Farningham, Kent
†Drew, Edw...Calcot, Kingscote, Wotton-under-Edge
Drew, Henry...Exe View, Alphington
†Drewe, E. Simcoe..The Grange, Honiton
†Drewitt, George...Manor Farm, Oving, Chichester
Drewitt, Henry...Milvill Farm, Titchfield
Drewitt, John...North Stoke, Arundel
†Drewitt, R. Dawtrey...Peppering, Arundel
Drewitt, Thomas...Piccard's Farm, Guildford
Drewry, George...Newton-in-Cartmel, Lancashire
Drinkwater, Fred.....Madley, Hereford
Driver, Robert Collin....4, Whitehall Place, S.W.
†Druce, A. F. Milton....Burghfield, Reading
†Druce, Joseph...Eynsham, Oxford
†Druce, Samuel...Eynsham, Oxford
†Drummond, A. R....Cadland, New Forest, Hants
Drummond, Dr. H...15, Westbourne Terrace, W.
Dryden, Thomas...The Kennels, Haydon Bridge
Ducane, Chas., M.P....Braxted Park, Witham

Duckham, T....Baysham Court, Ross, Herefordshire
†Duckworth, Sir J., Bart....Wear House, Exeter
†Duckworth, Russell...Murtrey Hill, Frome
Dudding, Thomas...Pockerby, Goole
Dudfield, Benjamin....Spetchley, Worcester
Dudin, John B....Hayes Grove, Bromley, S.E.
Duffield, James...Great Baddow, Chelmsford
Dufty, Thomas...Knapthorpe, Newark
Dugdale, W. Douglas...West Chaldon, Dorchester
Duggan, H. Stephens...Hereford
Duke, Henry...Broadmain, Dorchester, Dorset
Duke, Stephen...Blakehurst, Arundel
Dumas, Francis Kuper...25, Fenchurch Street, E.C.
Dumbrell, James, jun....Ditchling, Sussex
Duncan, W. G....Bradwell House, Stony Stratford
†Duncombe, Hon. O., M.P....Waresley, Biggleswade
Duncombe, Hon. W. E., M.P....The Leases, Bedale
†Duncombe, Sir P. P., Bart....Bletchley, Bucks
†Dun, Finlay...Weston Park, Shipston-on-Stour
Dunford, Thos.....Tyne Iron Office, Newc.-on-Tyne
†Dunn, Gen., R.E....Denford House, Hungerford
†Dunn, Thomas...1, York Gate, Regent's Pk., N.W.
†Dunn, Wm. H....Inglewood, Hungerford
Dunn, Mrs....Newcastle-on-Tyne
†Dunne, Thomas...Bircher, Leominster
Dunnicliff, W....Frowell, Nottingham
Duplessis, Jules...Newtown Park, Lymington
Duppa, T. D....Longville, Shrewsbury
Du Pré, C. G., M.P....Wilton Park, Beaconsfield
Dupuis, Rev. G. J...Eton College, Windsor
Durant, Richard...Sharpham, Devon
Durham, Makin...Thorne, Yorkshire
†Duval, Fernand R.....Château de Marolles, France
Dyer, George...Wey House, Alton
Dyer, John...Hook Grange, Tichfield
Dyke, Sir P. H., Bart....Lullington Castle, Dartford
†Dyke, Rev. T. H...Long Newton, Stockton-on-Tees
Dyne, F. B....University Club, Suffolk Street, S.W.
Dyott, Col....Freeford Manor, Lichfield
Dyson, John....24, Dock Street, Leeds

E.

Ealand, John Robert....Aisthorpe, Lincoln
Eardley, Wm....Larkton Hall, Malpas
†Earle, Frederic W.....Edenhurst, Prescot, Lancash.
Easam, William....Averham Park, Southwell
East, Sir Gilbert W., Bart....Hall Pl., Maidenhead
†Easthope, Sir John, Bart....Fir Grove, Weybridge
Easton, George....Horsley Hill, South Shields
†Easton, James...Nest House, Gateshead
Easton, James...Grove, Southwark, S.E.
Easton, William....6, Hammet Street, Taunton
Eastwood, R...Thorney Holme, Whitewell, Clitheroe
Eaton, Charles O....Tixover Hall, Stamford
†Eaton, George...Spixworth, Norwich
Eckley, Richard...12, Darlington Place, Bath
Eddison, Edwin....Headingley Hill, Leeds
Eddison, Francis...Adel Mill, Leeds
Eddison, R. W....Headingley Hill, Leeds
Eddison, William...Huddersfield

†Eddowes, Thos. Henry....Pontesbury, Salop
†Eden, Hon. Wm. Geo....Doncaster
†Eden, J....Beamish Pk., Chester-le-Street, Durhar
Edge, Davis...Outhill, Studley, Warwickshire
†Edge, James Thomas...Strelley Hall, Nottinghar
†Edmonds, F. Ezek....Berryfield Ho., Bradford, Wil
Edmonds, R....West Buckland, South Molton
Edmondson, John...Grassyard Hall, Lancaster
Edmunds, Edmund...Rugby
Edwardes, Frederick...Pilbroath, Carmarthen
Edwards, Francis...Pickeridge House, Slough
Edwards, Frederick...Barnham, Thetford
Edwards, Henry N....Broadwood, Leominster
Edwards, James L....Rochester, Kent
Edwards, John James....Broad Heath, Presteign
Edwards, Joseph...Hutton, Weston-super-Mare
Edwards, Joseph Priestley.. Fixby Park, Halifax
Edwards, Peter Norman...Brinsop Court, Herefor
†Edwards, Thomas....Wintercott, Leominster
Edwards, William...Crewe Arms, Crewe
Effingham, Earl of...Tusmore House, Bicester, Oxo
Egerton, Sir P. de M. G., Bt. M.P....Tarporley
Egerton, Lord...Tatton Park, Knutsford
Eggar, James...Brinsted, Alton
Egginton, S. H....North Ferriby, Brough, Yorkshi
Eichholtz, R.....Newcastle-on-Tyne
Ekin, Thomas...Newmarket
†Eland, S. E...ManorHo., Stanwick, Higham Ferre
Elcho, Lord, M.P....Armisfield, Haddington, N.B
Eley, Charles...Beavers Farm, Hounslow, W.
Eley, W.H., jun...Islingham, Frindsbury, Rochest
†Elkins, J. N...Elkington, Welford, Northamptons
†Elliot, John...Chapel Brampton, Northampton
†Elliot, John Lettsom...48, Grosvenor Street, W.
Elliott, John...Moor Hall Courts, Newc.-on-Tyne
Elliott, John....Newcastle-on-Tyne
Ellis, Charles...Franklands, Hurstpierpoint
Ellis, Charles...Meldreth, Royston, Cambridge
Ellis, Job...Oswestry
†Ellis, John...Artington, Guildford
Ellis, I. P....The Field, Hampton Bishop, Herefo
†Ellis, Robert Ridge...Yalding, Kent
Ellison, Charles...Oldbury Lodge, Bridgnorth
Ellison, Francis Charles...Low Sizergh, Milnthorp
Ellison, P. G.....Royal Arcade, Newcastle-on-Ty
Elliston, B. A....Croydon Arrington, Cambridge
Ellman, R. H....Landport, Lewes
Ellman, Thomas...Beddingham, Lewes
Elmhirst, Rev. E....Shawell Rectory, Rugby
†Elmsall, Mansfeldt de C....The Club, York
Elorza, General da Francisco...Tubia, Oviedo
†Elston, Capt. W....St. Ann's Rd., North Brixton,
Elton, Sir E. M., Bt....Widworthy Court, Honiton
Elton, Major Robert James...Whitestanton, Char
Elvidge, Benjamin...Leven, Beverley
Elwes, John H....Closeburn House, Cheltenham
Embleton, Dennis, M.D....Newcastle-on-Tyne
Embleton, Robert...Backworth, Newcastle-on-Ty
Emery, E. Crosswiller...Storrington, Sussex
Emery, R. Coleman..Hurston Pl., Storrington, S
Emson, H. H....Nether Hall, Cherry Hinton, Cam
†Enfield, Viscount...Wrotham Park, Barnet, N.
England, Richard...Binham, Wells, Norfolk

Enniskillen, Earl of....Florence Court, Ireland
†**Entwistle**, John S....Foxholes, Rochdale
Enys, John Samuel...Enys, Penryn, Cornwall
Epton, W. M....Langton Wragby, Lincolnshire
Erichsen, H. G...Newcastle-on-Tyne
†**Erkoig**, Adolphus...Derekegyhaza, Pesth, Hungary
†**Erle**, Rev. Christopher...Hardwicke, Aylesbury
Erle, Rt.Hon.SirW.,Kt...Bramshot Grange, Liphook
Ernest, Henry...4, Whitehall, S.W.
Errington, George....10, Rutland Square, Dublin
†**Errington**, Rowland...Sandon, Hexham
Esam, Wm....Averham Park, Southwell
Esdaile, W. C. D....Burley Park, Ringwood, Hants
†**Estcourt**, E. D. B....Newnton House, Tetbury
Ethelstone, Rev. C. W....Up Lyme, Lyme Regis
Ethrick, Anthony....North Hylton, Sunderland
Evans, E. M....Llynbarried, Nantmel, Kington
Evans, Edward...Boveney Court, Windsor
†**Evans**, E. Bickerton...Whitbourne Hall, Worcester
Evans, Edward...7, Morton Street, Sunderland
Evans, George...Wimborne, Dorset
†**Evans**, Henry J....Bank, Cardiff
Evans, H. Rawlings, jun....Dilwyn, Leominster
Evans, Isaac Pearson...Griff, Nuneaton
Evans, James Eaton...Haverfordwest
Evans, John...Uffington, Salop
Evans, Robert....Tolladine, Worcester
Evans, R. P....Orpines, Wateringbury, Maidstone
†**Evans**, R. W....Eyton Hall, Leominster
Evans, Samuel...Darly Abbey, Derby
Evans, Thomas....Astwood, Worcester
Evans, Thos. M...West Hill, Wandsworth, S.W.
Evans, Capt. T. B....Uddens, Wimborne, Dorset
Evans, Thomas Sutton...Sawston, Cambridge
†**Evans**, Rev. W. E....Burton Court, Herefordshire
Everett, Rev. C. H.....Netherton Ho., Hungerford
Everett, Frederick...Shaw Rectory, Newbury, Berks
Everington, William....Skegness, Boston
†**Everington**, Wm. D....Plumstead House, Norwich
Everitt, James...North Creake, Fakenham
Evershed, Henry...Park Hall, Gosfield, Halstead
Evershed, John....Albury, Guildford
Ewen, Thomas L'Estrange...Dedham, Colchester
Ewings, Wm...Lond. & Westm. Bank, Lothbury, E.C.
Exall, W....Kates Grove Works, Reading, Berks
Exley, Wm. H....Wisbeach
Eyke, John...Stanton, Shiffnal
†**Eyre**, Edwin...The Cottage, Bishop's Stortford
†**Eyre**, G. E....Warrens, Stoney Cross, Southampton
Eyre, Henry R....Shaw House, Newbury
Eyre, Martin...17, Bellevue Terrace, Hull
Eyre, R. T....Bartley, Totton, Southampton
†**Eyres**, Capt. Harry...Knockwood Park, Tenterden
Eyton, John Wynne...Lee's Wood, Mold
†**Eyton**, Thos. C....Vineyard, Wellington, Salop

F.

Faber, C. Wilson...Northaw House, Barnet, N.
Fail, Thomas...Blue House, Nedderton, Morpeth
Fair, J....Warton Lodge, Lytham, Preston, Lancas.
Fair, Jacob Wilson....Lymm, Warrington
†**Fair**, William....Aston-by-Budworth, Northwich
Fairbairn, George...Holmes Chapel, Cheshire
Faithful, Rev. G. D....Lower Heyford, Oxford
Falla, W. C.....Crammer Dyke House, Gateshead
Falmouth, Viscount...Mereworth Castle, Maidstone
Fane, Cecil...
†**Fardon**, H. F....The Firs, Bromsgrove
†**Farhall**, J. N....Tillington, Petworth
Farley, Rev. C. Turner...Moorhall, Stourport
Farley, Stephen L....Heaton Dene, Newc.-on-Tyne
†**Farmer**, Archibald H....Theale, Reading
Farmer, Edward...Comberford Hall, Tamworth
Farmer, James....Stretford Bury, Leominster
Farnham, E. B.....Quorndon House, Loughborough
Farnworth, J. K....Alderley Edge, Manchester
Farnworth, Thos. M....Alderley Edge, Manchester
†**Farr**, Richard...Wormesley Grange, Herefordshire
†**Farr**, Wm.Wyndham...Iford, Christchurch, Hants
†**Farrell**, Edward W....3, Merrion Sq. East, Dublin
†**Farrer**, Edmund...Sporle, Swaffham
Farrer, James...Ingleborough, Settle
†**Farrer**, O. W....1, Hamilton Place, Piccadilly, W.
Farthing, Walter...Stowey Court, Bridgwater
Faulkner, C. F. A....Bury Barnes, Burford, Oxon
Faulkner, John...Bretby Farm, Burton-on-Trent
Faviel, George...Amcotes Lodge, Goole
Faviell, J. Brown...Stockeld Park, Wetherby
†**Faviell**, Mark, jun....
Faviell, William Fred....Down Place, Guildford
Fawcett, E. A....Childwick Hall, St. Albans
Fawcett, John...Durham
Fawcett, Theodore....
Fawcus, John....South Charlton, Chathill
Fawcus, Henry William....Elford, Chathill
Fawkes, F. H....Farnley Hall, Otley
Featherstone, Wm....Sunley Hall, Kirby-Moorside
Featherstonhaugh, R....Rockview, Killucan
Feilden, Captain H. M....Bank Hall, Clitheroe
Feilden, Captain J....Witton Park, Blackburn
Feetham, John...Great Burdon, Darlington
Felgate, W....9, Westbourne Crescent, W.
†**Fellowes**, Jas....29, Gloucester Place, W.
Fellowes, Robert....Bitteswell Hall, Lutterworth
Fellowes, Rev. T. L....Brighton Rectory, Acle
Fellows, W. Manning...Ormesby, Great Yarmouth
†**Felton**, Clement...Dunton, Fakenham
Fenton, John T....Waterloo Colliery, Leeds
†**Fenton**, Joseph....Bamford Hall, Rochdale
†**Fenton**, William....Beaumonds, Rochdale
Fenwick, George A....The Bank, Newc.-on-Tyne
Fenwick, George....North Shields
†**Fenwick**, Henry, M.P...Southill, Chester-le-Street
Fenwick, J. C.....Riding Mill, Northumberland
†**Ferard**, Charles Colton...Ascot Place, Windsor
Ferrabee, Jas...Phœnix Ironworks, Stroud, Gloucest.
†**Ferris**, T....Manningford Bohune, Pewsey, Wilts
†**Ferris**, William...Draycot, Marlborough
Festing, R. G...1, Queen Sq. Place, Westmst., S.W.
Ffooks, Thomas...Sherborne
†**Ffoulkes**, Major John J....Llandyssil, Shrewsbury
Fiddes, Thomas F....Towneley Lodge, Burnley
Field, George...Ashurst Park, Kent

†Field, Henry...East Lodge, Tulse Hill, S.
Field, James Pope...
Field, Samuel...Farnsfield, Southwell
†Field, William...224, Oxford Street, W.
Field, William David...Swan Hill, Shrewsbury
†Fielden, Joshua...Stansfield Hall, Todmorden
†Fielden, S....Centre Vale, Todmorden
Fieldsend, C. R., jun....Kirmond, Market Rasen
†Filmer, Sir E., Bt., M.P...East SuttonPk.,Staplehst.
Finch, J....1, Adelaide Place, London Bridge, E.C.
†Finch, Rev. W....Warboys, Huntingdonshire
†Findlay, John...Garnstone, Hereford
Findlay, T. Dunlop...Easter Hill, Glasgow
Finlay, Alex. S....Castle Toward, Greenock
Finney, Samuel....Gateshead
†Finnis, Steriker...The Elms, Hougham, Dover
Firkins, Geo. John....Bishampton, Pershore
Firth, Samuel...Burley Wood, Leeds
Firth, William...Burley Wood, Leeds
Fisher, A. B....Poulshot, Devizes
Fisher C,....Prospect Ho., Distington, Whitehaven
Fisher, Henry....Michaelchurch, Ross
Fisher, James...Adelaide
Fisher, John...Carrhead Farm, Cross Hills, Leeds
Fisher, P.....Prospect Ho., Distington, Whitehaven
Fisher, T. Forest...Ince Blundell, Liverpool
Fison, Cornell....Manor House, Feversham, Cambs.
†Fison, John Potterton...Horningsea, Cambs.
†Fitzgerald, Maj. H. T.G...MapertonHo.,Wincanton
Fitzgerald, Wm. Seymour....Hollbrook, Horsham
Fitzherbert, Sir W., Bt...Somersal Herbert, Uttoxeter
†Fitzhugh, Thomas Lloyd...Plas Power, Wrexham
Fitzhugh, Rev. Wm....Street, Lewes
Fitzpatrick, Rt. Hon. J. W....Abbeyleix, Ireland
Fitzroy, Lt.Col. H....Stratton Strawless, Norwich
Fitzroy, George...Grafton-Regis, Stony Stratford
†Fitzwilliam, Hon. C.W....Alwalton, Peterborough
Fitzwilliams, E. C. L....Belmont, Tenby
†Fitzygram, Fred., Lieut.-Col....Carlton Club, S.W.
Fleming, John....Newcastle-on-Tyne
†Fletcher, Lt.-Col. E. C....Kenward, Yalding
Fletcher, George...Shipton, Cheltenham
Fletcher, John Charles...Dale Park, Arundel
Fletcher, John Lynch....R.A. College, Cirencester
Fletcher, John....Sandway Lodge, Northwich
Fletcher, John....Merton, S.
†Fletcher, J. P....Sunbury, S.W.
†Fletcher, Capt. Joseph...Whitehaven, Cumberland
Fletcher, Robert...Hanover Square, Newc.-on-Tyne
Fletcher, Thomas...Deeping St. Nicholas, Spalding
Fletcher, William...Radmanthwait, Mansfield
Flower, Charles Henry...France Farm, Blandford
Flower, G. F. A...Stafford Farm, Dorchester
Floyer, John...Hints, Tamworth
†Floyer, John...Stafford, Dorchester
Floyer, John Wadham...Martin, Horncastle
†Foljambe, Geo. Saville...Osberton House, Worksop
Folkstone, Viscount...Longford Castle, Salisbury
Fookes, H....Whitechurch Farm, Blandford
Forbes, John M....Dropmore, Maidenhead
Forbes, Sir John Stuart, Bart....Fettercairn, N.B.
Ford, Rev. C. H....Bishopton, Stockton-on-Tees
Ford, Elias....Abbotskerswell, Newton Abbott
†Ford, George....Barlaston, Stone, Staffs.
Ford, J., jun....Rushton Farm, Blandford
Ford, John....Morton Hall, Warwick
Ford, John....Market Rasen
Ford, William...Brinsop, Herefordshire
Fordham, Edward...Odsey House, Royston
Fordham, Edward King...Ashwell, Baldock
Foreman, George..Benton Grange, Newc.-on-Tyne
Forester, G. T....Ercall Magna, Wellington,Shrops.
Forester, Rev. R. T....Elmsley Lodge, Leamington
Forrest, Thomas...Spurston Hall, Tarporley
Forrester, George...Tombland, Norwich
†Forrester, Jos. James...
Forster, Abraham T....Garretstown, Kinsale
†Forster Charles...Hanch Hall, Lichfield
Forster, Edward....Salisbury Hall, Chingford
Forster, George....Washington, Durham
Forster, Richard....White House, Gateshead
Forster, R. C....White House, Gateshead
Forster, Robert...Tottenham Green, N.
†Forster, Samuel...Southend, Sydenham, S.E.
Forster, W....Herrington-hill Ho., Fence Houses
Fort, George...Alderbury House, Salisbury
Fortescue, Hon. G....Boconnock, Lostwithiel, Cornw.
Foster, J....Ledsham, Milford Junction
Foster, J. P....Killhow, Wigton, Cumberland
†Foster, John James...Mansion Street, Lincoln
†Foster, Richard...Castle, Lostwithiel, Cornwall
Foster, Richard....Gloucester
Foster, T. Nelson....Gloucester
Foster, Wm....Canwick House, Lincoln
†Foster, William...Stourton Court, Stourbridge
†Foster, W. O., M.P....Stourton Castle, Stourbridge
Fothergill, James...Beeston, Nottingham
Fothergill, Matthew...Cefnrhychdir, Newport, Mon.
Fothergill, R....Hensol Castle, Cowbridge, S.Wales
†Fountaine, Bernard T...Stoke House, Bletchley
Fowle, W....Market Lavington, Wiltshire
Fowler, Charles...Whitelands, Bicester
Fowler, John K., jun....Aylesbury
Fowler, M....Little Bushy Farm, Watford
†Fowler, Robert C....Gunton Hall, Lowestoft
Fowler, R., jun....14, Bennett's Hill, Birmingham
Fowler, Edward Parsons....Jersey
Fowler, Francis...Henlow, Biggleswade
Fowler, L....Little Bushey Farm, Watford, Herts.
Fowlie, Wm....
Fox, Alfred Lloyd...Manure Works, Penrhyn
†Fox, Chas. B....Malpas, Newport, Monmouthshire
Fox, Frederick F....Melbourne, Derby
†Fox, G. Lane...Bramham Park, Tadcaster
Fox, Robert...Falconhurst, Cowden, Kent
Fox, W....Elfordleigh, Plympton St. Mary, Devon
Fox, William...Dunston, Sleaford
Frampton, Henry...Okers Wood, Dorchester
Francis, Clement...Quy Hall, Cambridgeshire
Francis, Frederick...Warley Place, Brentwood
Francis, S. R. G....Cranham Place, Romford, E.
Franklin, Edward L....Ascott, Wallingford
Franklin, John...Ewelme, Wallingford
†Franklin, Richard...Clemenstone, Bridgend
Franklin, Robert...The Park, Thaxted
Franks, George...Thong, Gravesend

.Bramley, Guildford
.. Westfield, Mountrath, Ireland
Culloden, Inverness
ı... High West Street, Gateshead
.. Elswick Villa, Newcastle-on-Tyne
East Parade, Newcastle-on-Tyne
, Bt... Burwood Pk., Walton-on-Th.
Y... 239, Hackney Road, N.E.
ardner... Rockfield, Hereford
.... Ashford, Staines
igh Heaton, Newcastle-on-Tyne
... High Heaton, Newc.-on-Tyne
.. Henham, Wangford
s.. Benton Pl., Newcastle-on-Tyne
nas... 27, Milbank St., S.W.
W....
Day... St. John's, Bungay

Regent Street, Cambridge
ugust... Moravia
ı... Newcastle-on-Tyne
Wherstead, Ipswich
. West Wratting Hall, Linton
mas... Boston, Bromley, S.E.
Baglake Farm, Dorchester, Dorset
Aighton Lodge, Gateshead
Lodge Park, Taliesin, Shrewsbury
ing... The Wergs, Wolverhampton
. South Lytchett House, Poole
. Worcester
ı... Elmham Hall, Thetford
Reading
Villes... Croydon, S.
... 84, Burton Street, Gloucester
l... Bushby House, Leicester
. Coxhoe, Ferryhill, Durham
. Birchill Farm, Baslow, Chesterfield
nes G. C.... The Chantry, Frome
is... Thorpe Hall, Elkington, Louth

G.

stus W.... Leigh House, Tooting, S.
T.... Baystone, Chipping Sodbury
. Kilnocks, Botley, Hants
.. Kingston Farm, Dorchester
Dorchester
s P.... Little Langford, Heytesbury
.. Claverdon Leys, Warwick
nt, M.P.... Serlby Hall, Bawtry
Gerard's Bridge, St. Helen's, Lanc.
s... Canwick Road, Lincoln
t E.... Nocton, Lincoln
... New Veterinary Col., Edinburgh
H.... Hayne House, Tiverton
.. Shotover House, Wheatley, Oxon
he Green, Thornton-le-Moor, Chester
I.... Stanwick, Higham Ferrers
... Heaves, Milnthorpe
.. Elm House, Winkfield, Windsor
s... Yarm, Cleveland
us.... Dunston Lodge, Gateshead
us Durham... Gateshead

Garbutt, William... Dunston Lodge, Gateshead
†Gard, R. Sommers... Rougemont House, Exeter
Garde, T.... Ballinacurra, Midleton, co. Cork
Gardner, Francis... Ryburgh, Fakenham
Gardner, R. W.... Parsonage, Ombersley, Droitwich
Gardner, Thos. K.... Leighton, Wellington, Salop
Gardner, W. A.... Hough Green, Chester
Gardner, William Nettleton... Wells, Norfolk
†Gardom, T. W.... The Yild, Baslow, Chesterfield
Gartit, Charles... Wincham Cottage, Knutsford
Garmston, John... Worcester
Garne, George... Churchill Heath, Chipping Norton
†Garne, John... Filkens, Lechlade
†Garne, Robert... Aldsworth, Northleach
†Garne, Wm.... Kilkenny Farm, Bibury, Fairford
Garnett, Jeremiah.... Wharfeside, Otley, York
Garnett, William... Clitheroe
Garnett, W. J., M.P.... Bleasdale Tower, Garstang
Garrard, E. H... Clopton House, Broadway, Worc.
Garrard, C. B. D.... Lamar Hall, St. Albans
†Garratt, John... Bishop's Court, Exeter
Garraway, E.... Norcott Farm, Wonersh, Guildford
Garrett, Richard... Carlton Hall, Saxmundham
Garrold, R. H.... Kilforge, Ross
Garsed, John... The Moorlands, Cowbridge
Garth, T. C.... Haines Hill, Reading
Gascoyne, Wm.... Bapchild Court, Sittingbourne
Gascoyne, William Whitehead... Sittingbourne
†Gaskell, Henry L.... Kiddington Hall, Woodstock
†Gatacre, Edward L.... Coton, Kidderminster
Gater, John... West End, Southampton
Gates, John A.... Grange Farm, Sapiston, Ixworth
†Gates, R.... 7, Sussex Place, Horsham
Gatty, George... Felbridge, East Grinstead
Gaudern, J.... Earl's Barton, Wellingborough
Gaunt, Thomas.... Smite, Worcester
Gauntlett, F. E... Leazes Terrace, Newcastle-on-Tyne
Gauntlett, W. H... Eston Junct., Middlesbro'-on-Tees
†Gauthorp, Henry... Widness, Warrington
†Gawne, Edw. Moore... Kentraugh, Isle of Man
†Geary, Sir W. R. P., Bt.... Oxen Heath, Tunbridge
Gee, Thomas... Brothertoft, Boston
Geldard, Chris. John... Cappleside, Settle
Gelderd, George A.... Aikrig End, Kendal
Gell, Robert.... Grimston Lodge, York
George, Thomas... Bythorne, Thrapstone
George, T. Willington... Bellevue House, Leeds
†German, George... Measham Lodge, Atherstone
Gervis, Sir G. E. M. T., Bt.... Christchurch, Hants
Gibb, James... Crown Villa, Southport
Gibbon, A... Staunton, Coleford, Gloucestershire
Gibbens, Edward... Minster, Isle of Thanet
Gibbons, Henry... Hampton Bishop, Hereford
Gibbons, Stephen... Brocklesby Park, Ulceby
†Gibbs, George... Belmont, Bristol
†Gibbs, Hen. H... St. Dunstan's, Regent's Pk., N.W.
Gibbs, Philip H.... Eckington, Worcester
Gibbs, Robert... Carhampton, Dunster
Giobs, Thomas.... Sawndby, Retford
Gibbs, Thomas... 26, Down Street, Piccadilly, W.
Gibbs, W.... Alveston Hill, Stratford-upon-Avon
Gibbs, Wm.... Tyntesfield, Bourton, Bristol
Giblett, John... Lower Clapton, N.E.

†Gibson, John Kirk..Ingleby, Lincoln
Gibson, Robt....South Benwell, Newcastle-on-Tyne
Gilbert, Henry...Barnby Manor, Newark, Notts
Gilbert, James...117, Wheeler's Road, Birmingham
†Gilbert, R....Ashby Hall, Berghapton, Norfolk
Gilbert, R., jun....Ashby Hall, Bergh Apton, Norf.
†Gilbert, Thomas W....The Close, Salisbury
†Gilbert, William A....Cantley, Acle
Gilbertson, M....Elm Cottage, Egham Hill, Surrey
Giles, Henry, jun....Croxton Park, Thetford
Gilford, William...North Luffenham, Uppingham
Gill, George...Weston, Shrewsbury
Gillespie, A...12, St. Mary's Terrace, Newc.-on-Tyne
Gillett, Charles...Cote House, Bampton, Oxon
Gillett, John...Fawler, Charlbury
Gillett, John...Minster Lovel, Witney
Gillett, Thomas...Kilkenny, Faringdon
Gillow, Rev. Charles...Ushaw College, Durham
Gilliatt, W. J..Ashby Puerorum, Horncastle, Lincsh.
Gilpin, James...Roseworth Villa, Newcastle-on-Tyne
Gilpin-Brown, G...Sodbury Park, Richmond, Yorks.
Gilstrap, G....Winthorpe House, Newark-on-Trent
Gilstrap, William..Fornham Pk., Bury St. Edmunds
Ginders, Samuel...Ingestre, Stafford
Giraud, Edward...Preston, Wingham
Glanville, R. Carew...Eccles, Newtown, Coldstream
Glaisier, William Richard...41, Charing Cross, S.W.
Glegg, J. B....Withington Hall, Chelford, Congleton
Glegg, Lt.-Col. E. Holt...Backford Hall, Chester
Glen, G....Stratton Audley Park, Bicester
†Glendining, Alexander...Red Leaf, Penshurst
Glenton, Frederick...Bensham, Newcastle-on-Tyne
Glover, John...Bangley, Tamworth
Glover, Robert...Wexford, Lichfield
Glynne, Rev. Henry...Hawarden Rectory, Chester
Glynne, Sir S., Bt., M.P...Hawarden Castle, Flintsh.
†Gobbitt, John...Wickham Market, Suffolk
Goddard, H. N...Manor Ho.,Cliffe,Wootton-Bassett
Goddard, Thomas...St. Fagans, Cardiff
Goddard, Wm. Gilbert...Broad Chalk, Salisbury
†Goddard, William R....Somerset House, W.C.
†Godsal, Philip Wm...Iscoyd Pk., Whitchurch,Salop
Godwin, Robert...Water Eaton, Cricklade
Godwin, William...Lugwardine, Hereford
Goggs, James...Great Baddow Park, Chelmsford
†Goldhawk, R., jun....Hasle Hall, Steer, Guildford
Goldingham, H. G...Newland Court, Malvern
Goldsmith, Thomas...Dairy Farm, Ixworth
†Gonne, Charles...Warley Lodge, Brentwood
Gooch, John Kerr...East Tuttenham, Norwich
†Gooch, John Virel...Reform Club, Pall Mall, S.W.
Gooch, Stephen...Honingham, Norwich
Good, Samuel C....Aston Court, Tenbury
Goodchild, Philip...Norfolk Farm, Windsor Park
†Goodden, John...Over Compton, Sherborne, Dorset
†Goodhart, Charles E....Langley, Beckenham
†Goodlake, F. Mills...Wadley Ho., Faringdon
Goodson, Wm....Hill Farm, Mitcham, S.
Goodwin, Frederick..Droitwich
Goodwin, G....Pershire Mills, Pershore, Worcsh.
Goodwin, J....Bath and West of England Soc., Bath
Goodwin, Ralph Willis..Burnham Abbey, Maidenh.
G~~ly, Golden...Broom House, Chapel, Halstead
Gordon, Charles...Discombe Park, Honiton
Gordon, James....Park House, Gateshead
Gordon, R....Kemble House, Cirencester
Gorringe, Hugh...Southwick Green, Shoreham
Gosford, Vincent...Tan-y-llan, Holywell, Flintshire
Gosling, John...Brewery, Bocking, Essex
Gosling, Robt...Hassobury, Bishop's Stortford, Herts
Gosling, Thomas G....15, Portland Place, W.
†Gosset, Major Arthur...West Park, Mortlake, S.W.
†Gotch, Wm. Hepburn...Bratton, Westbury
Goucher, John...Woodsetts, Worksop
Gough, Ashwin D...Hinton-on-the-Green, Evesham
Gough, Edward...Gravel Hill, Shrewsbury
Gould, John...Hyde Hall, Denton, Manchester
Gould, Joseph...Newhall, Broadclist, Devon
Gould, Rev. Joseph...Hurst Green
Gouldbourne, Joseph...Wilkesley, Whitchurch
Goulding, Wm....108, Patrick Street, Cork
Gouthwaite, Richard...Lumby, South Milford
†Gow, James...Fowler's Park, Hawkhurst, Kent
Gow, Thomas...Cambo, Newcastle-on-Tyne
†Gower, A. L....Castle Malgwyn, Newcastle Emlyn
Gower, Andrew...Market Drayton
†Gower, Erasmus...Clynderwen, Narberth, S.W.
†Gower, J. Leveson...Westwood, Colchester
†Gower, Robt. F....Clynderwen, Narberth, S.W.
†Gower, G. W. G. Leveson...Titsey Pk., Godstone
Grace, E. N....Newcastle-ou-Tyne
Grace, Nathaniel...Broomfield, Newcastle
Grace, T. C....Broomfield, Newcastle-on-Tyne
Grace, William...Scotswood Villa, Newc.-on-Tyne
Grace, Wm....Park Road, Newcastle-on-Tyne
†Grafton, Duke of...Euston, Thetford
Graham, Alexander...Barnston, Birkenhead
†Graham, James...Beaulieu, Southampton
Graham, James...York Road, Leeds
Graham, Walter...West Drayton, Uxbridge
Graham, William, jun....Pewet, Abingdon
Graham, Wm., jun....Newport, Monmouth
Grain, Peter...Shelford, Cambridge
Grant, Effingham..Bucharest, Wallachia
†Grant, Sir G. McPherson, Bt..Ballindalloch Cas., N.B.
Grant, John...Wester Hill, Linton, Staplehurst
Grant, William...Litchborough, Weedon
†Grantham, George...Barcombe Place, Lewes
Grantham, Captain, H. V....Scawby, Brigg.
Grantham, Henry..Scawby, Brigg
Grantham, R.B., C.E., F.G.S..7, Gt. Scotland-yd., S.W.
Grantham, Rev. Thos....Bramber, Steyning
†Granville, Earl...Aldenham, Bridgnorth
Graves, A. E...Rosbercon Castle, New Ross, Wexford
Graves, Robert...Charlton, Shaftesbury
†Gray, G. W...5, St. Mary Abbot's Ter., Kens., S.W.
Gray, John C...King's Grange, Castle Douglas, N.B.
†Gray, Jonathan...Summerhill, Bath
Gray, Thomas...Newcastle-on-hyne
Grazebrook, George...The Race Course, Stourbridge
Greaves, William...Bakewell, Derbyshire
Green, A. Whyte..Cray House, Glensher, Blairgowrie
Green, E. W..Flint Ho., Holcombe, Stratton-on-Foss
Green, Rev. G. W...Court Henry, Dryslwyn, Carmar.
Green, John...Newtown Farm, Worcester
Green, Robert...Scalby, Scarborough

Green, Robert Yeoman...Newcastle-on-Tyne
Green, Rev. Thomas...Vicar of Badby, Daventry
†**Greenall**, G., M.P....Walton Hall, Warrington, Lanc.
Greene, E....West Gate, Bury St. Edmund's
†**Greene**, Harry A....Crown Street, St. Ives, Hunts.
Greene, Michael...Bloomfield, Gateshead
Greene, John...Millbrook, Magany, Kildare
Greene, John...Rodsley House, Gateshead
†**Greene**, Thomas...Whittington Hall, Lancaster
Greene, Wm....Ditcham Park, Petersfield
Greenwood, Charles...Wallingford, Berkshire
†**Greenwood**, J., M.P....SwarcliffeHall, Ripley, York
Greenwood, R....Towse Ho., Ludford, Market Rasen
Greetham, Thomas...Stainfield Hall, Lincoln
Greetham, William...Stainfield Hall, Wragby
Gregg, James...Fencote Abbey, Leominster
†**Gregg**, Thomas...
†**Gregor**, Gordon W.F...Trewarthenick, Grampound
Gregory, George...Crowhurst, Battle
Gregory, J. S....Harlaxton Manor, Grantham
Gregson, Brian Paget...Caton, Lancaster
†**Gregson**, Matthew...Toxteth Park, Liverpool
Gregson, T...New Bridge St., Newcastle-on-Tyne
Grenfell, Arthur Riversdale...Travellers' Club, S.W.
Grenfell, Chas. P., M.P....38, Belgrave Sq., S.W.
Grenfell, Riversdale W....Ray Lodge, Maidenhead
†**Grenville**, Ralph N....Butleigh Ct., Glastonbury
Gresswell, Dan....Louth
Greville, Col. Fulke S...North Mimms Park, Hatfield
†**Grey**, Rt. Hon. Sir G., Bt., M.P...Fallowdon, Alnwick
†**Grey**, Hon. Brow. N. Osborn De...Watton, Norfolk
†**Grey**, Adm. Hon. F. W...13, New St., Sp. Gns., S.W.
†**Grey**, Hon. & Rev. F. De...Copdock Recty., Ipswich
†**Grey**, Hon. G. De...11, South Audley Street, W.
†**Grey**, Charles G...Diston, Corbridge-on-Tyne
Grey, Jas....Kimmerston, Wooler, Northumberland
Grey, John...Lipwood House, Haydon Bridge
Griffin, Alfred E....Wolverhampton
Griffin, Clement W....Werrington, Peterborough
Griffin, Edward...Towersey, Thame
Griffin, John...Borough Fen, Market Deeping
Griffin, Fred. C....Methwold, Brandon, Norfolk
Griffith, C. Darby...Padworth House, Reading
Griffith, Edw. H....Plas-Newydd, Trefnant, Rhyl
Griffith, J...Llwynduris, Newcastle-Emlyn
Griffith, John, jun....Trevorgan, Cardigan
Griffith, Samuel Y....Star Hotel, Oxford
Griffithes, Thomas J....Bishop's Castle, Salop
Griffiths, Edward...New Court, Hereford
Griffiths, John...The Weir, Hereford
†**Grimes**, Wm. Howlett..Bubbenhall, Kenilworth
Grimston, Lt.-Col. Oswald A...Yeatton, Leamington
†**Grissell**, Thos...Norbury Park, Dorking
†**Grisewood**, H....Daylesford Ho., Chipping Norton
Grosvenor, Earl, M.P....28, Princes Gate, S.W
Grove, Philip...Eastcote, Towcester
Groves, John..25, Oxford Street, Newcastle-on-Tyne
Grundy, E. S....Reddish Hall, Warrington
Gubbins, Joseph...Kilfrush, Knocklong, Limerick
Guerrier, W. G..17, Crescent, Camden-rd. Villas, N.W.
Guilding, Richard...Malvern Wells
Gulliver, William...Swarcliffe, Banbury
Gulliver, Wm. H....Collingborne, Marlbro'
Gulston, Alan James...Woodland Castle, Swansea
Gunn, R...Great Dalby Lodge, Melton Mowbray
Gunner, William...Will Hall, Alton
†**Gunter**, Captain Robert...Wetherby
†**Gurdon**, Brampton...Letton Hall, Shipdham, Norf.
†**Gurdon**, Rev. P....Cramworth Rectory, Shipdham
†**Gurdon-Rebow**, J....Wivenhoe Pk., Colchester
†**Gurdon**, William...Brantham, Manningtree
Gurney, Jason...Hounslow, W.
†**Gurney**, John Henry, M.P....Easton, Norwich
†**Gurney**, Russell...8, Palace Gardens, Hyde Pk., W.
Gurney, Samuel, M.P...Carshalton, S.
Guthrie, James...Sedgwick Place, Gateshead
†**Guthrie**, John...Guthrie Castle, Forfarshire
Gwyn, H., M.P....Dyffryn, Neath, Glamorganshire
Gwyn, Rich. H....Astbury Hall, Bridgnorth, Salop
Gwyn, Wm. Edw....Plas Cwrt Hyrs, Carmarthen
Gyles, John...Aplayhead, East Retford, Notts

H.

Haansbergen, W.I..Endfield Lodge, Newc.-on-Tyne
Hacker, John Heathcote...Leek, Staffordshire
Hadden, A....The Old Parks, Ashby-de-la-Zouch
Haddock, Henry..6, Glo'ster Pl., Regent's Pk., N.W.
Hagen, Jacob...Ropley House, Alresford
Haggard, Wm. M. R...30, Clarendon Sq., Leamington
Hagger, Franklin...Hertford
Haggie, Peter...Whaggs House, Whickham, Durham
†**Haig**, J. H....Highfields Park, Wythiham, Sussex
Haine, George...Over Farm, Gloucester
Haines, Edward...Moorwood House, Cirencester
Haines, J. Pool...Duntisbourne House, Cirencester
Hainworth, William...Hitchin
Hale, Chas. C....Glenlochay, Killrie, Perthshire
Hales, C...Manor House, Bassingbourne, Royston
Hales, Edward...North Frith, Tonbridge
Halewood, Edward...Great Crosby, Lancaster
Halford, Charles...Newbold Mill, Worcestershire
Halford, T....Glenfren, Newtown, Montgomerysh.
Halford, T....Newbold-on-Stour, Shipston-on-Stour
Hall, Alexander Hall...Watergate, Emsworth
Hall, Benjamin...Wood Farm, Malvern Wells
Hall, Charles...Down Lodge, Reigate
Hall, Collinson...Navestock, Romford, E.
Hall, Francis...Park Hall, Mansfield
Hall, George...Garford, Yarkhill, Ledbury
Hall, George...1, Copland-terrace, Newc.-on-Tyne
†**Hall**, Henry...
Hall, Henry...Alton
Hall, James...Scarborough Hall, Beverley
†**Hall**, John...Hesley Hall, Tickhill, Rotherham
Hall, J.O....1, Brunswick Row, Queen's Sq., W.C.
Hall, John...Sibthorpe, Newark-on-Trent
Hall, Major-Gen....Carlton Club, Pall Mall, S.W.
†**Hall**, Marshall...Blacklands Park, Calne, Wilts
Hall, Richard...Raglan House, Neath, Glamorgansh.
Hall, T....Duke's Oak, Brereton, Congleton
Hall, Thomas K....Holly Bush, Burton-on-Trent
Hall, T. Young...11, Eldon Sq., Newcastle-on-Tyne
†**Hall**, William...Ashton, Leominster
Hall, Wm...Seven Springs, Cubberley, Cheltenham

Hallam, John...Newcastle, Staffordshire
Hallam, Thos....Bridlesmith Gate, Nottingham
Hallett, Fred. Fran....The Manor House, Brighton
†Halliday, J....Chapel Cleeve, Taunton
Halliday, Thomas C....
Hallowes, Thomas...Glasswell Hall, Chesterfield
†Halls, Joseph...Denham Hall, Bury St. Edmund's
Halse, J. C....Pulworthy, Molland, South Molton
Halse, Philip...Molland, South Molton
Halsey, Rev. J. F. Moore...Hemel Hempstead
Halsey, Thomas...Compton House, Newent
Halsted, Thomas...Woodcote, Chichester
Halton, Rev. Emmanuel..Winfield Manor, Alfreton
†Hambro, Charles...Milton Abbey, Blandford
†Hambrough, Albert J....Steep Hill Castle, Ventnor
Hamersley, Hugh...Great Haseley, Tetsworth
†Hames John...Rotherby, Leicester
†Hamilton, Capt. Archibald...Rozelle, Ayr
Hamilton, Chas. W....Hamwood, Dunboyne, Ireland
†Hamilton, John...Sundrum, Ayr, N. B.
†Hamilton, John...Hilston Park, Monmouth
†Hamilton, Sir R. N. C., Bt., K.C.B...Park Steet, W.
†Hamilton, Wm. M....2, Orchard Place, Canterbury
Hammond, Dr...11, Charlotte St., Bedford Sq., W.C.
Hammond, Horace John...Chapel Farm, Eltham
Hamond, Charles Frederick...Newcastle-upon-Tyne
Hamond, Philip...Ashurst Lodge, East Grinstead
†Hamond, W. Parker...Pampisford Hall, Cambridge
Hampton, George...Findon Park Farm, Worthing
†Hanbury, E....Eastrop House, Highworth
Hanbury, Robert...Poles, Ware
Hancock, Abraham...Little Grove, Ropley, Alresford
Hancock, J. Donne...Halse, Taunton
Hancock, T....Staplefield Common, Crawley, Sussex
Hand, James...Ludlow
†Handley, Maj. Benj....Folkingham, Lincolnshire
Handy, Edward...Sierford, Cheltenham
Hanmer, Col. H....Stockgrove, Leighton Buzzard
Hanmer, Sir J., Bt., M.P...Bettisfield Pk., Whitchurch
Hannam, Charles...Northbourne Court, Deal
Hannam, Fenwick...Newcastle-on-Tyne
Hannam, Henry J....Burcote, Abingdon
†Hannay, Robt....Springfield, Ulverston
Hansell, Thomas...North Shields
Hanson, T. A...162, Upper Brook St., Manchester
Harbin, George...Newton House, Yeovil
†Hannay, Robert...Springfield, Ulverston
Harcourt, Colonel Francis V...5, Carlton Gns., S.W
†Hardacre, Richard...Hellifield, Leeds
Harding, Egerton W....Old Springs, Market Drayton
Harding, George...Durweston, Blandford
†Harding, John...Dursley, Gloucestershire
Harding, James...Waterson, Dorchester
Harding, S. T....Stinsford Farm, Dorchester
Harding, Wm. C....Thame
Hardinge, Edm. S....Bounds Park, Tonbridge Wells
Hardon, Edwin...Edgeley, Stockport
Hardstaffe, Dodson...West Leak, Loughboro'
Hardwick, Alfred...Hangleton, Shoreham
Hardy, James...Jaques Hall, Manningtree
†Hardy, John...Dunstall Hall, Burton-on-Trent
Hardy, Peter...The Grange, Claines, Worcester
Hardy, Richard...Marchington, Uttoxeter
†Hardy, W. H. C....Letheringsett Hall, Holt, Norfolk
Hardy, William Thistleton...Market Overton
Hare, Joseph...Wilton Farm, Beaconsfield
†Hare, Sir J., Bart....12, Pall Mall East, S.W.
Hare, Sir Thos., Bt....Stow Hall, Downham Market
Hare, Thomas W....Berthddu, Caersws, Montgomery
†Harewood, Earl of...Harewood House, Leeds
†Harford, J. B....Stoke House, Stoke Bishop, Bristol
†Harford, John Scandrett...Blaize Castle, Bristol
†Harford, W....Barley Wood, Wrington, Bristol
Harker, James...Tibshelf, Alfreton
Harker, Rev. Wm....Camberwell, S.
Harkes, William...Lostock, Knutsford
Harle, W. Lokey...Newcastle-on-Tyne
†Harman, Hon. L. King..Ballymena, co. Longford
†Harper, Latimer...Chilton Cottage, Hungerford
Harrett, R....Kirkwhelpington, Newcastle-on-Tyne
Harries, Francis, jun....Cruckton Hall, Shrewsbury
Harriman, William...Blaydon-on-Tyne
†Harris, Lord...Belmont, Faversham
Harris, John...Sutton, Kegworth, Derby
Harris, Richard...Wootton Grange, Northampton
Harris, Thomas...Stonylane, Bromsgrove
Harrison, G. P....Gembling, Lowthorpe, Hull
Harrison, John...Summerlands, Kendal
Harrison, J., jun...Snelston Hall, Ashbourne, Derbys.
Harrison, J., jun....Heaton Norris, Stockport
Harrison, J. F....Caterham Court, Redhill
Harrison, J. T...Frocester Court, Stonehouse, Glosc.
†Harrison, Richard...Wolverton, Stony Stratford
Harrison, Rev. R.J...Caerhowell, Garthmyl, Shrewsb.
Harrison, Rev. J. H....Bugbrooke Rectory, Weedon
Harrison, Thomas...Belsay, Newcastle-on-Tyne
Harrison, William H....Oxendon, Northamptonsh.
Harrowby, Earl of...Norton Ho., Campden, Gloucess.
Hart, George...Wakefield
Hart, Henry P....Beddingham, Lewes
Hart, Thomas...Ascott, Leighton Buzzard
†Harter, Rev. G. G....Cranfield, Newport Pagnell
†Harter, Jas. Collier...Broughton Hall, Manchester
Hartill, Jeremiah...Willenhall, Wolverhampton
Hartley, Gilferd Wm....Rosehill, Whitehaven
Harvey, Chas. W....Walton-on-the-Hill, Liverpool
Harvey, Edw. N....Fawley, Southampton
Harvey, John J....Statenboro' House, Sandwich
†Harvey, Richard...Greenaway, Torquay
Harvey, Richard Hart...Harroldston, Haverfordwest
Harward, John...Chaddesley Corbet, Kidderminster
Harwood, Thomas...Belstead Hall, Ipswich
†Haslewood, Lewis Robert...33, Queen's Sq., W.C.
Haslam, Charles...Basingstoke
Haslar, Richard...Aldingbourne, Chichester
†Hassall, Geo....Shelford Manor, Ratcliffe-on-Trent
Hassall, Wm....Babney, Whitchurch, Salop
Hatfield, Chas. Taddy...Hartsdown House, Margate
Hatfield, Thomas...St. Martin's, Stamford
Hatherton, Lord...Teddesley, Penkridge
Hatton, William...Kingston, Tetsworth, Oxon
Havelock, Michael...Newcastle-on-Tyne
Havers, William...Bacon's Farm, Mountnessing
Haward, R....Mells Hill, Halesworth
Hawarden, Viscount...Dundrum Castle, Cashel
Hawdon, William W....Walkerfield, Staindrop

r, **Archibald**...Englefield Green, Surrey
rorth, **R. S**...Forest, Mountrath, Queen's co.
H. M....Tredunnock, Usk, Monmouthsh.
,**T**....**Smallbridge**, Bures St. Mary, Suffolk
, **Thos.**, jun....Sugwas, Hereford
James...Stubbings, Maidenhead, Berks
eorge...Gateshead Iron Works, Gateshead
, **Robert**...Newcastle-on-Tyne
, **W**....BenwellCottage, Newcastle-on-Tyne
, **William**...Benwell, Newcastle-on-Tyne
l, **Alfred**...Thirsk
Anderson..17, York Ter., Rgnt's. Pk., N.W.
W....**Sudbury**, Derby
enry...Stamford
hn Higson...Frodsham
John...24, Gloucester Sq., Hyde Park, W.
ol. Richard...
om John...West Woodgates, Salisbury
, **H. S**....Folkington, Willingdon, Sussex
, **Chas**....Dartmouth Grange, Dartmouth
, **Frederick**...Needham Market
, **J. Curtis**...Quedgeley House, Gloucester
, **Edward W**....Sillins, Bromsgrove
, **George**...Derby
, **James**, jun....Derby
, **Henry**...Blakemere House, Hereford
, **Sir A. Grey**, Bt....Noseley Hall, Leicester
hn...Orwell Works, Ipswich
hn...Elswick Grange, Newcastle-on-Tyne
lliam Alston...East Grinstead [nard Castle
a, Rt. Hon. E., M.P....Gilmonby Hall, Bar-
, **Morley**...Whorlton, Darlington
Edward...2, New Square, Cambridge
I. Newton...Highfield, Hemel Hempstead
Edward Charles...Goldwynds, Dorking
hristopher...Leeds
m....St. Margaret's, Ware
.Stephen Street, Abbots Salford, Evesham
, **Alfred**...Angmering, Arundel
. **Y.**, M.D....Newcastle-on-Tyne
hn...Bickley, Tenbury
....Hefferstone, Weaversham, Northwich
homas...Little Benton, Northumberland
te, Capt. Eustace...Blanshard, Lyndhurst
te, J. M....Connington Cas., Stilton, Hunts.
e, Richard...Baxterby, Atherstone
John...Eaton, Market Drayton
R. T....Dodicote Grange, Market Drayton
Thomas...Alton, Cheadle, Staffordshire
G...50, Westmoreland Ter., Newcastle-on-T
G...2, Indian King's Court, Newcastle-on-T
Thomas...Cox Lodge, Newcastle-on-Tyne
oseph...Liverpool
Thos. Shaw...Rodbaston Hall, Penkridge
, **G. W. M**....India
rthur...Vernon Hall, Bishop's Waltham
ichard...1, Barton Street, Gloucester
Wm. Hawker...26, Manchester Sq., W.
g, George...Pershore
g, Richard...Bentley Manor, Bromsgrove
g, Wm....Coldicott, Moreton-in-the-Marsh
n, John A....Erwarton Hall, Ipswich
r, John...Shelton, Newark, Notts

Henderson, John...**The Shrubbery, Sandwich**
Henderson, George...**Harton, South Shields**
Henderson, John...**Horsley Hill, South Shields**
Henderson, W....**Fowberry Maines, Belford**
Henderson, William...**Harton, South Shields**
Hendy, James...**Trenouth, Grampound**
Heneage, Geo. H. Walker...**Compton Basset, Calne**
†Henley, Rt. Hon. J. W., M.P....**Waterperry, Oxon**
†Henning, James...**6, Upper Avenue Road, N.W.**
Henning, William L....**Frome House, Dorchester**
Henry, Frederick H....**Lodge Park, Straffan, Ireland**
Henry, Capt. James...**Blackdown House, Petworth**
Henton, Samuel...**268, Westm. Bridge Road, S.**
Hepburn Thomas...**Clapham Common, S.**
Heppell, John Todd...**3, Prior Terrace, Tynemouth**
Hepworth, Joshua...**Rogerthorp, Pontefract**
Herbert, Edmund...**Powick, Worcester**
†Herbert, John Maurice...**Rocklands, Ross**
Herbert, William...**Kempsey, Worcester**
Hercy, John...**Cruchfield House, Maidenhead**
Herrick, Wm. Perry...**Beau Manor Park, Loughboro'**
†Herries, Lord...**Everingham Park, Pocklington**
Hersee, Dennett...**Wepham, Chichester**
†Hertefeld, Baron de...**Liebenberg, Berlin**
†Heseltine, E....**Blackheath Park, S.E.**
Hesketh, Sir T. G., Bt., M.P...**Rufford Hall, Ormskirk**
Heslop, Rev. Gordon...**Cossall, Nottingham**
Heslop, George...**Fatfield House, Chester-le-Street**
Heslop, Isaac...**Urpeth, Chester-le-Street**
†Hester, G. P....**Town Clerk's Office, Oxford**
Hetherington, Robt....**Manor Ho., Ropley, Alresford**
Hett, John...**Gainford, Darlington**
Hewer, John E., jun....**Vern House, Hereford**
Hewer, William...**Hill Farm, Northleach**
Hewer, Wm....**Sevenhampton, Highworth, Wilts**
Hewertson, Nelson...**Newport, Monmouthshire**
Hewitt, Jas....**Posbroke, Titchfield**
Hewitt, James...**King James Street, Gateshead**
Hewson, John Dale, M.D....**Coton Hill, Stafford**
Hext, Thomas...**Trewarren, St. Austell**
Heygate, Captain E. N....**Buckland, Leominster**
Heygate, Robert H. J....**Docklow, Leominster**
†Heytesbury, Lord...**Heytesbury, Wilts**
†Heywood, Sir Benj., Bt....**Claremont, Manchester**
†Heywood, J....**26, Palace Gardens, Kensington, W.**
Heywood, Wm. H....**Dunham Massey, Altrincham**
†Hibbert, John...**Braywick Lodge, Maidenhead**
†Hibbert, P. E. T....**Bilton Grange, Rugby**
Hibbert, T. J...**Broughton Grove, Newton-in-Cartm**
†Hibbert, Washington...**Bilton Grange, Rugby**
Hickin, John...**Bourton, Rugby**
†Hicks, Francis...**Halstead, Sevenoaks**
Hicks, L...**Paddock Lodge, Kentish Town, N.W.**
†Hicks, Thomas...**Halstead, Sevenoaks**
Hickman, Capt. W. T....**Woodlands, Havant**
Hickson, Richard...**Hougham, Grantham**
Higginbotham, J....**Pensax Court, Tenbury**
Higginbotham, Samuel...**Killermont, Glasgow**
Higgins, H....**Woolaston Grange, Lydney**
Higgins, Thos....**Lower Binton, Stratford-on-Avon**
Higgins, Col. Wm. B. Cole...**Pict's Hill, Bedford**
†Higginson, Edmund...**Saltmarsh, Bromyard**
Hilder, John...**Sandhurst, Kent**

Hilder, William...Tenterden
Hill Trevor, Lord A. E....Norwood Park, Southwell
†Hill, T. Rowley..Catherine Hill House, Worcester
Hill, Hon. T. H. Noel...Berrington, Shrewsbury
Hill, Col. C. J....Cotgrave Place, Nottingham
Hill, Rev. J....The Citadel, Hawkstone, Shrewsbury
Hill, Henry...Thornton, Pickering
Hill, Henry...22, Queen's Gate Terrace, S.W.
Hill, Henry...Spalding
Hill, J....Elderslie House, London Road, Worcester
Hill, Rev. R. P....Bromesberrow Rectory, Ledbury
Hill, Richard...Orleton Court, Ludlow
Hilliard, Geo. Bridge...Springfield, Chelmsford
Hilliard, William Edw....Cowley House, Uxbridge
Hilton, George...Flemings, Wickford, Essex
Hilton, Henry...Sole St. Ho., Selling, Faversham
Hilton, Stephen Musgrave...Brambling, Wingham
Hilton, Capt. Thos....Nackington Ho., Canterbury
Hincks, T. C....Brackenboro', Thirsk
†Hinde, J. H....Acton House, Felton, Northumb.
†Hippisley, John...Lamborne Place, Hungerford
†Hipwell, G. M....Cheam, S.
Hitch, Saml., M.D....Sandywell Park, Cheltenham
Hitchcock, H....Chitterne All Saints, Heytesbury
Hitchin, Thomas...Wardle Tile Works, Tarporley
Hitchings, Frederick...Havant, Hants
Hitchman, John, M.D....Mickleover, Derby
Hobbs, Charles...Maisey Hampton, Cricklade
Hobbs, William...Derward's Hall, Bocking, Essex
Hoblyn, W. Paget...Denzel Farm, St. Columb
Hobson, J....Kilkea, Castle Dermot, Kildare
Hobson, John George...Long Sutton
Hockenhall, John...The Flax Yards, Tarporley
Hockin, John...Bude, Cornwall
Hodge, G. W...George St. East, Newcastle-on-Tyne
Hodgkinson, Enoch...Morton Grange, Retford
Hodgkinson, Grosvenor, M.P....Winthorpe, Newark
Hodgkinson, Richard...Osberton Grange, Worksop
Hodgson, A...Drayton Hall, W. Drayton, Middlesex
†Hodgson, E. G...Charsfield Hall, Wickham Market
Hodgson, Isaac Scott...Sodylt Hall, Ruabon
Hodgson, J ...3, Framlington Place, Newc.-on-Tyne
Hodgson, James...Liverpool
Hodgson, John...Newcastle-on-Tyne
Hodgson, John G....North Dene, Gateshead
Hodgson, Joseph...Blyth, Cumberland
Hodgson, R...Crofton Mills, Blyth, Northumberland
Hodgson, Richard...Chingford
Hodgson, R. W....North Dene, Gateshead
†Hodgson, William...Gilston Park, Herts
Hodgson, William...Grimston, Tadcaster
†Hoffschlaeger, J. F....Weisin, bei Mecklenburg
Hogg, G....46, Eldon Street, Newcastle-on-Tyne
Hogg, James...Buckton, Belford, Northumberland
Hogg, William...Mitford Steads, Morpeth
Hogge, William...Thornham Hall, Lynn
Hoggins, Thomas...Trafford Lodge, Chester
†Holbech, Rev. Chas. Wm....Farnborough, Banbury
Holben, R. Rowley...Barton, Cambridge
Holborow, Daniel...Knockdown, Tetbury
Holbrooke, George...Attenborough, Nottingham
Holcombe, Rev. G. F....Sherwood Lodge, Nottingham
Holder, William...Eastham, Tenbury

Holding, Henry...Fardington, Alton
Hole, James...Knowle, Dunster
Hole, James...Muskham Woodhouse, Newark
Hole, William...Hannaford, Barnstaple
Holehouse, J....Llangathock House, Abergavenny
Holl, William...Link Tower Lodge, Malvern
Holland, Francis D....Cropthorne, Pershore
†Holland, Dr. Chas....St. Chad's, Lichfield
Holland, C....Madeley Pk. Farm, Newcastle, Staf
Holland, William...Streethay, Lichfield
Hollick, Thomas...Llandudno
Holliday, James...Lord Street, Liverpool
Hollings, John Albert...How Caple, Ross
†Hollings, J. C....Snitterfield, Straford-on-Avon
†Hollist, Hasler...Lodsworth, Petworth
Holloway, E...Eldon Street, Newcastle-on-Tyne
Holloway, Horatio...Marchwood, Southampton
Holloway, Thos....Tittenhurst Lodge, Sunninghi
†Holloweg, M. de B....Runorva, Nakel, Prussia
Holmden, James...Edenbridge
Holmes, George...Brooke Lodge, Norwich
†Holmes, Gervas...Brockdish Hall, Scole
Holmes, Rev. John...Brooke Hall, Norwich
Holmes, J....Prospect Place, Globe Lane, Norwic
Holroyd, Fred....Knowles Fixby, Huddersfield
Holton, George...Wiston Grove, Colchester
Holton, William Fifield...Cleeve Prior, Evesham
Homer, T. Alner...Tolpuddle, Dorchester, Dorset
Homfrey, Samuel...Glen Usk, Caerleon, Newport
Hone, H....Stoke Orchard, Cheltenham
†Hony, Rev. P. F....25, Old Bond Street, W.
Honywood, William...
Honywood, Mrs....Marks Hall, Kelvedon
†Hood, Sir Alex. A., Bt....Bicknoller, Taunton
Hooker, John...Oatlands Park, Walton-on-Tham
Hooper, Geo...Cottington Court, Deal
†Hooper, R. N...Llansannort Ct., Cowbridge, Glan
†Hope, Joseph...Whoof House, Carlisle
Hope, Edwardes Thos. Hen....Moore Park, Ludl
Hope, Sam. Pierce...Bettley Hall, Newcastle, St
†Hopkins, Henry...Burnside, Van Dieman's La
Hopkins, John...Tidmarsh House, Reading
Hopkinson, John...Manton, Worksop
Hopper, George...Fence Houses
Hopper, W. Cuthbert...West Hill, Wandsworth, S.
Hopton, Rev. John...Canon-Frome Court, Ledb
Hopton, Rev. Wm. P....Bishop's Frome, Bromyar
†Horley, Thomas, jun....The Fosse, Leamington
†Hornby, Rev. Robt....Lythwood Hall, Shrewsb
Hornby, Rev. W....St. Michael's Vicarage, Garsta
Hornby, W. H., M.P...Shrewbridge Hall, Nantwi
Hornby, Capt. W., R.N....Knowsley Cott., Pres
Horncastle, E....Edwinstowe, Ollerton, Notts.
Horncastle, J., jun....Edwinstowe, Ollerton
Horne, Thomas...Moreton-in-the-Marsh
†Horner, James B....Lincoln
Horner, Rev. John...Mells Park, Frome, Somers
Horner, John G....Martins Town, Dorchester
Horner, Wm....Hamel's Farm, Puckeridge, War
Horniblow, William T....Ripple, Tewkesbury
Hornsby, Richard...Spittle Gate, Grantham
Hornsby, Richard, jun...Spittle Gate, Grantham
†Hornyold, J. V...Blackmore Park, Upton-on-Sev

ohn...Stevington, Bedford
George...Harley, Much Wenlock, Salop
Thomas...Harnage Grange, Cressage, Salop
, Wm. Thomas...Seamer House, Yarm
T. Berry, M.P....Bellamour Ha., Rugeley
, Matthew...27, Leadenhall Street, E.C.
, Thos....Haselbury, Crewkerne, Somerset.
, William....North Perrott, Crewkerne
, Chandos Wren...Harewood, Ross
n, J. A....Hallingbury Pl., Bishop's Stortfd.
n, Richard Archer...Coopersale, Epping
n, S. E....Yacht Tavern, Greenwich, S.E.
n, Thomas...Hemshill Manor, Nottingham
n, J., M.D...Percy St.,Barras Br.,New.-on-T.
, Hon. C. W. G., M.P....Brampton
, Charles...Biddenham, Bedford
, Edward J....Rise Farm, Nocton, Lincoln
, Henry...Greystoke Castle, Penrith
, Hon. James...Hazelby, Newbury
, James...Bedford
, Robert...Broughton Hall, Wrexham
, R. G. F....Temple Bruer, Lincoln
, Wm....Windsor Terrace, Taunton
, Alexander...Marston Court, Pembridge
Earl...Gopsall, Atherstone
, Henry...Coates, Cirencester
John...Ewen, Cirencester
E., M.P....Morningthorpe, Long Stratton
P....Hamilton Ter., St. John's Wood, N.W.
, John...Bowthorpe Hall, Norwich
n, H. A...Bexwell Rectory, Downham Mar.
Nathaniel...Witney
, Daniel...Flintham, Newark, Notts
ck, Joseph...Liverpool
rd, Wm. Egerton...St. Leonard's, Horsham
ty, Rev.N...Eastwell Hall, Melton Mowbray
Robert...Barlby Grove, Selby
ston, Ferdinand..Swanston Hall, Cambridge
, John...Castleacre Lodge, Brandon
m, T. Moore...Castleacre, Brandon
, Thos....Longford, Market Drayton
ith, W....Sycamore House, Haltwhistle
p, James...West Sleekburn, Morpeth
, Alfred...Thorness, W. Cowes, Isle of Wight
es, H.R...Kinmel Pk., St. Asaph's, Denbighs.
es, Hugh...Woodgate, Danehill, Uckfield
, Hugh Robt....Ystrad, Denbigh
, John...Britannia Square, Worcester
, John, jun....Severn Terrace, Worcester
, J. H...Cliff House, Curbar, Calver, Sheffield
e, W....Pembroke Bank, Pembroke, S.Wales
, Charles...Hall Grove, Bagshot
erston, P. S., M.P....Mollington, Chester
le, G....Elswick Grange, Newcastle-on-Tyne
e, William Turner...Sealand, Chester
y, Wm....Oak Ash, Chaddleworth, Wantage
reys, Henry...Woodhouse, Loughboro'
ries, E....Pershore
hries, John...Kidderminster
ries. John...Hampden, Andoversford
dge,Thos..Great Woodcote Fm, Carshalton, S.
n...Fenwick, Newcastle-on-Tyne
G....Frenchwood, Preston, Lancashire

Hunt, John...Shirley, Southampton
Hunt, A. H....Birtley House, Chester-le-Street
Hunt, Thomas...Thornington, Coldstream
Hunt, William...Leicester
Hunt, William...Deeping St. Nicholas, Spalding
Hunter, Lt.-Col. Charles..Mount Severn, Llanidloes
Hunter, George...Wallsend
Hunter, Henry...Newcastle-on-Tyne
Hunter, Hen. Launoy...Beech Hill, Reading
Hunter, J...South Preston Lodge, South Shields
Hunter, John Joseph..Wickham Grange, Gateshead
Hunter, Patrick...Mt. Alyn, Rossett, Wrexham
Hunter, Samuel S....Old Court, Abergavenny
Hunter, W....Moor Lodge, Newcastle-on-Tyne
†Hunstman, Benjamin...West Retford, Notts
Hunting, Charles...South Hetton, Fence Houses
Hurle, Joseph Cooke...Brislington, Bath
Hurlston, Wm....Heathcote, Wasperton, Warwicksh.
Hurrell, William...Newton, Cambridge
Hurt, Albert F....Alderwasley, Belper
†Huskinson, Thos....Epperstone, Southwell
Hussey, Edward...Scotney Castle, Lamberhurst
Hussey, Phineas Fowke...Wyrley Grove, Walsall
†Hussey, Rich. Hussey...Upwood, Huntingdon
Hussey, T...Stud Farm, Skirmett, Henley-on-Tha.
Hutchings, Rev. R. S....Monkton Wyld, Charmouth
Hutchinson, Hon. Col. H. K...Weston Ho., Towcester
Hutchinson, John...Appleton Lodge, Warrington
†Hutchinson, James...Cowley Manor, Cheltenham
Hutchinson, John...Brougham Castle, Penrith
†Hutchison, Robert...Carlowrie, Kirkliston, N.B.
Hutley, Jonathan...Rivenhall Hall, Witham
Hutt, Rt. Hon. William...Gibside Hall, Gateshead
Hutt, John...Water Eaton, Oxford
Hutton, J....36, Marley Street, Newcastle-on-Tyne
Hutton, Thomas...Upton Gray, Odiham
Hutton, William...Gate Burton, Gainsborough
Huxtable, Ven. Archd...Sutton Waldron, Blandford
†Huyshe, Rev. J....Clysthydon Rectory, Cullompton
Hyde, F. C....Ashdown House, East Grinstead
Hyde, J. T., M.A....Island of Herm, Guernsey
Hyett, John Edw....Haydon's Elm, Cheltenham
Hyett, W. H....Painswick, Gloucestershire
Hymers, Joseph A....Whickham Park, Gateshead

I.

Ide, John...West Wittering, Chichester
Ilderton, Rev. T...Felton, Acklington, Northumb.
Iles, Daniel...Fairford Retreat, Fairford
†Iles, Francis...Barnoldby-le-Beck, Grimsby
Iles, John...Binbrook Hill, Market Rasen
Impey, William...Broomfield Hall, Chelmsford
Inge, Chas. Henry...Whittington Hurst, Lichfield
Inge, Col. Wm....Thorpe, Tamworth
Ingham, Robert...Westor, South Shields
Ingram, Hugo F. M....Hoarcross, Rugeley, Staffords
†Ingram, John A...Wylye, Heytesbury
†Ingram, Joseph...Pleck House, Accrington
Ingram, William...Armley, Leeds
Insole, James Harvey...Ely Court, Llandaff
†Innes, William...Field Place, Warnham, Horsham

†Ireland, J. Ireland Clayfield...Brislington, Bristol
Ireland, John Smith...Forthampton, Tewkesbury
Irving, Clark...8, Hyde Park Square, London, W.
Isaac, John Whitmore...Boughton, Worcester
Isaacson, John...Clare, Suffolk
Isaacson, Wm. Parr...Newmarket
Isham, Sir C. E., Bart...Lamport Hall, Northampton
Isham, Rev. R....Lamport Rectory, Northampton
Isherwood, Arthur B....Tynhalig, Trefnant, Rhyl
Ive, Edward P....Langley, Slough
Ive, John G....The Trenches, Langley, Slough
Ives, Capt. Ferdinand..St. Catherine's Hill, Norwich
Izon, John B....Walsgrave-on-Sowe, Coventry

J.

Jackson, Daniel...Chadwell Place, Grays, Essex
Jackson, F....6, Carlton Place, Newcastle-on-Tyne
Jackson, G. F....Alcester Lodge, Bromsgrove
Jackson, J....Aynscomb House, Orpington, Kent
Jackson, Matthew...Bilsthorpe, Newark, Notts
Jackson, P. R...Blackbrook, Gresmont, Hereford
Jackson, Richard...Noctorum, Birkenhead
Jackson, Thomas...Eltham Park, Kent
†Jackson, William...Oak Bank, Carlisle
Jackson, William Fenwick...Newcastle-on-Tyne
Jackson, Wm. Kay...Barbot Hall, Rotherham
†Jacobsen, C. C....Cranham Farm, Cirencester
Jacson, Chas. Roger...Barton, Preston, Lancashire
Jaggard, Joseph...Leek Wooton, Warwick
James, Edward...Holeyn Hall, Newcastle-on-Tyne
James, Isaac...Tivoli, Cheltenham
James, Jas....North Sodston, Narberth, Pembroksh.
James, James William...Mappowder, Blandford
James, J. A...Bridge Town Farm, Stratford-on-Avon
James, Richard...High Street, Haverfordwest
James, Richard...Llanrwst
James, T....Otterburn Tower, Newcastle-on-Tyne
James, Sir Walter C., Bt....Betteshanger, Sandwich
†James, Capt. Wm. E....Barrack Park, Carlisle
Jameson, Thomas...Newcastle-on-Tyne
†Jaques, Leonard..Easby Abbey, Richmond, Yorks.
Jaques, R. M....Easby Abbey, Richmond, Yorks.
Jaques, T. G....Staddlethorpe, Howden, Yorkshire
†Jarrett, John...Camerton House, Bath
Jarvis, Sir Raymond, Bt....Cove Cottage, Ventnor
Jarvis, T. A....Higher Bolberry, Kingsbridge, Devon
†Jay, John...46, West Seventeenth St., New York
Jefferson, Henry...Rothersyke, Whitehaven
Jefferson, Rev. J. Dunnington..Thicket Priory, York
Jefferson, Cpt. J...Ballaughton Ho., Douglas, I. of Man
†Jefferson, Robert...Preston Hows, Whitehaven
Jeffreys, N. N...Hollybrook Ho., Shirley, Southamp.
Jeggo, Thos. B....Mounts, Great Saling, Braintree
†Jegon, Trew...Slough
Jekyll, J....Carholme Terrace, Newland, Lincoln
†Jenkins, John B....Kingstone House, Abingdon
Jenkins, Richard David...The Priory, Cardigan
†Jenkinson, Sir George, Bt....Eastwood, Berkeley
Jenkinson, Joshua...Anfield, Cockermouth
†Jenner, George...Parsonage House, Udimore, Rye
Jennings, Richard...Carmarthen

Jervis, Hon. E. Swinfen...Aston Park, Staffordsh
†Jervoise, F. E. J....Herriard Park, Basingstoke
Jessop, Joseph...Grove Farm, Chiswick, W.
†Jobez, Charles...17, Boulevard Madeleine, Paris
Jobling, Edward...Hill Top Cottage, Carlisle
Jobling, George...Tynemouth
Jobling, J...Framlington Place, Newcastle-on-Tyn
Jobling, Mark L....Newcastle-on-Tyne
Jobling, T. W....Point Pleasant, Newcastle-on-Tyn
Jobson, William...Buteland, Hexham
†Jodrell, Sir Edw. R., Bt....64, Portland Place, W
Johnson, A. H....Manor House, Acton, W.
Johnson, A. H., jun...Hanger Hill Farm, Ealing, W
Johnson, C. E....5, South Parade, Newcastle-on-Tyn
Johnson, Charles W....25, Mark Lane, E.C.
Johnson, Cuthbert Wm....Waldronhurst, Croydon
Johnson, C. W...Manor Cot., Larkhall Rise, Claphan
Johnson, Edward...The Deanery, Chester-le-Stre
Johnson, E. W....Chichester
Johnson, Francis Dixon...Apleyheads, Durham
†Johnson, George...Blaco Hill, Retford, Notts
†Johnson, Rev. H. L....Binderton Ho., Chichester
Johnson, Isaac...Blaydon-on-Tyne
Johnson, James...East Harptree, Bristol
Johnson, John...South Pickenham, Swaffham
Johnson, Joseph...Windsor
Johnson, Rev. P....Wimborthy, Chumleigh, Dev
Johnson, R. S....Haswell Colliery, Fence Houses
†Johnson, R. W...Bricklehampton Hall, Pershore
Johnson, Thomas...Ellington, Morpeth
Johnson, T. C....Chevet, Wakefield
Johnson, Thomas...Halton Grange, Runcorn
Johnson, Thomas...The Hermitage, Frodsham
†Johnson, Thomas...Whittlesea, Cambridgeshire
Johnson, Walter...Trench Hall, Gateshead
Johnson, Walter F....Leicester
†Johnston, Alex. R....The Grove, Yoxford, Suffolk
Johnston, J. Lindsay...Crondall, Farnham, Surrey
Johnstone, Edward...3, King's Bench Walk, E.C.
†Johnstone, Rev. George...Broughton, Hunts
†Johnstone, J. C. H....Hardwick Hall, Durham
Johnstone, W. R. H....Hardwick Hall, Ferryhill
Joicey, Edward...Newcastle-on-Tyne
Joicey, John...Urpeth Lodge, Fence Houses
Jollands, William D....Buxshalls, Lindfield, Suss
†Jolliffe, Sir W. G. H., Bt., M.P...Heath Ho., Petersfie
Jonas, John Carter...3, St. Mary Street, Cambridg
Jonas, Samuel...Chrishall Grange, Saffron Walde
Jones, Benjamin..Talardd, Llanybyther, Carmarth
†Jones, David, M.P....Pantglas, Carmarthen
Jones, Edward...6, York Crescent, Clifton, Bristol
Jones, George...Stareton, Kenilworth
Jones, George...Whiston Lodge, Penkridge
Jones, G...Whitley Ct., Upton St. Leonard's, Glou
Jones, Hugh...Llanllyfin, Caernarvon
Jones, Harvey Bowen...49, Montagu Square, W.
Jones, H. P....Portway House, Warminster
†Jones, James Cove...Loxley, Warwick
†Jones, John...Bla'no's, Llandovery, S. Wales
Jones, John...Bryn Adda, Dolgelly
†Jones, J. E....Springfield, Braunton, Hereford
Jones, R. Hesketh...North Brook House, Dover
Jones, R. P....The Hermitage, Whitchurch, Salop

†Jones, Sir W., Bt....Cranmer Hall, Fakenham
Jones, W. H...Canon Bridge, Madley, Hereford
†Jones, Wm....Harrington, Shiffnal
Jones, W. Hope...Hooton Farm, Sutton, Cheshire
†Jones, W. B....Lissdare, Clonakilty, Ireland
Jordan, Francis...Eastburn, Driffield
Jordan, Joseph...Hardwick Terrace, Gateshead
Jordan, Wm....Charlton Kings, Cheltenham
Josling Geo. F....Berners Roding Hall, Dunmow
Jowett, Rev. J. F....Kingston, Bagpuze, Abingdon
Jowitt, Christopher...Palterton, Chesterfield
Joyce, Charles...Bishopsgate House, Egham
Joyce, Thomas...Vale Farm, Sudbury, Harrow, N.W.
Juckes, Mrs. Mary...Cotwall, Wellington, Salop
†Justice, Henry...Hinstock, Market Drayton

K.

†Karslake, Rev. W. H.....Mesham, Southmolton
†Kay, J. R....Bass Lane House, Bury, Lancashire
Kay, R....Forcett Valley, Darlington
Kearsey, Charles...Glewstone, Ross
Keary, H. W....Aldenham, Bridgenorth
Keeling, Charles...Congreve, Penkridge
Keeling, Chas. R....Yew Tree Farm, Penkridge
†Keene, Rev. C. E. R....Swincombe Ho., Nettlebed
Keep, Richard...Aldermaston, Reading
Kekewich, S. Trehawke, M.P....Peamore, Exeter
Kelham, Robert....Bleasby Hall, Southwell
†Kelsall, H., jun....Pinnacle Hill, Kelso, N.B.
†Kemble, Horatio...Potter's Bar, Barnet, Herts
†Kemble, Thomas...Runwell Hall, Chelmsford
Kemp, Jesse....Thurlby Grange, Alford
Kendrich, Edward...Weeford, Lichfield
†Kennaway, Sir John, Bart....Escot, Honiton
Kennedy, David...Oriental Club, W.
Kennedy, Charles Burton....Kirklands, Ulverstone
Kennedy, Myles....Burton Cottage, Ulverstone
Kennedy, Primrose W....Drumellan, Ayr
Kennedy, Rt. Hon. T. F....Dalquharran Castle, N.B.
Kenrich, George...Thurgarton Hill, Southwell
†Kensington, Edward Thomas..Moolham, Ilminster
†Kenyon, Hon. E....Maesfen, Whitchurch, Salop
†Kerrich, John...Geldeston Hall, Beccles
Kerry, the Knt. of (P. Fitzgerald)...Kerry
Kersey, Clement....Whitton, Ipswich
Kersey, James...Farlton Farm, Cirencester
†Kesterton, Thomas...Sutton, S.
Kett, George Samuel...Brook House, Norwich
†Kettle, Geo. Mackenzie...Dallicott Ho., Bridgenorth
Key, Sir Kingsmill Grove, Bt....95, Newgate St., E.C.
Keyes, Hen. James...Ashingdon, Rochford, Essex
†Keyworth, Henry Joseph...Cottesford Pl., Lincoln
†Keyworth, J. R. Haldenby..Greestone Ho., Lincol.
Kibble, Thomas...Green Trees, Tunbridge
Kiddle, F. G....Moreton, Dorchester
Killick, Arthur...Deepdene Park Farm, Dorking
Kimber, Jas. Weaving...Tubney Warren, Abingdon
Kimber, Thomas ...Great Tew, Enstone
Kimberley, John Parrier....Gloucester
Kindersley, E. Leigh...Syward Lodge, Dorchester
King, C....North Lodge Farm, Potter's Bar, Barnet
King, Charles Allen...98, Piccadilly, W.
King, George...Saffron Walden
King, James K., M.P...Staunton Park, Leominster
King, John G....Beedon, Newbury
King, John L....Thorp Abbots, Scole Inn, Norfolk
King, Rev. J. Meyers...Cutcombe Vicarage, Dunster
King, Hon. J. P. L., M.P....Woburn Pk., Chertsey
King, Richard King Meade...Walford, Taunton
King, Richard H.....Wooperton, Alnwick
King, R. Meade...Pyrland Hall, Taunton
King, S....Bockhampton Farm, Lambourne, Berks
King, William...Barton, Bury St. Edmund's
King, W. C....Warfield Hall, Bracknell
Kingdon, Rev. S. N....BridgeruleVicar., Holsworthy
Kingdon, Samuel...Layrick, Thorverton
Kingsley, Thomas...Boarscroft, Tring
†Kingscote, Col. R. N. F.. M.P...Kingscote, Glouc.
Kingsford, John...Esher, Surrey
†Kingsmill, Wm....Sydmonton Park, Newbury
†Kingsnorth, Alfred...Great Chart, Ashford, Kent
†Kingsnorth, Edward...Brookland, New Romney
Kinloch, Colonel...Logie, Kirriemuir, N.B.
Kinnaird, Lord...Rossie Priory, Inchture, Perthshire
†Kirk, R....Gale Bank, Leybourne, Wensleydale
Kirkaldie, Viscount...Windsor
Kirkby, Thomas...Cuxwold, Caistor
Kirkham, Thomas...Biscathorpe House, Louth
Kirkland, Sir John, Bt....17, Whitehall Place, S.W.
Kirkpatrick, Capt. John ...Monk's Horton, Hythe
Kirwan, J. Stratford..Moyne, Ballyglunin, co. Galway
Kitson, James...Leeds
Kitson, William...Torquay
Knapping, Dale...Sutton, So. Shoebury, Ingatestone
Knatchbull, Rev. W...Cholderton Lodge, Amesbury
†Knatchbull, Wm....Babington, Frome, Somersets.
†Knight, A. J. R. B...Downton Castle, Leintwardine
Knight, Edward...Chawton House, Alton
†Knight, E....High Leadon, Newent, Gloucestersh.
Knight, John...Widness, Warrington
Knight, John...Forthampton, Tewkesbury
Knight, R. Farthing...Hereford
Knight, Thomas...Norlington, Lewes
Knight, Thos. Henry...Stoke CanonVicarage, Devon
†Knighton, Sir W., Bt...Blendworth Ldg., Horndean
Knollys, J. E....Fitzhead Court, Taunton
Knollys, Gen....Blount's Court, Henley, Oxon
Knowles, James...Wetherby
Knox, Octavius N....Corgrig Lodge, Foynes, Ireland
Kyrke, Rich. V....Stansby Lodge, Wrexham

L.

Laidlaw, Adam...Greenfield Place, Newc.-on-Tyne
Laidman, C. J....Royal Arcade, Newcastle-on-Tyne
†Lake Edward....Hill Side, Strood, Kent
Lake, James...Newlands, Teynham, Sittingbourne
Lake, Robert...Milton, Canterbury
Lakeman, John...Costislost, Bodmin
Lakin, Henry...Link End, Malvern
Lamb, R. O.....Axwell Park, Gateshead
†Lamb, William ..Hay Carr, Ellel, Lancaster
Lambe, John...Church Bank, Bowdon, Manchester

†Lambert, Chas....Sunk Island, Otteringham, Hull
†Lambert, Henry T....74, Grosvenor Street, W.
Lambert, Wm. Chas....Misterton, Crewkerne
†Lancaster, T....Bownham Ho., Stroud, Gloucestsh.
†Landor, H. Eyres...Tachbrooke, Leamington
Lane, John...Barton Mills, Cirencester
Lane, Ebenezer....Honey Street, Marlborough
Lane, John...Wenlock Brewery, City Road, E.C.
†Lane, William...Broadfield, Northleach
†Langdale, Lady....Eywood, Kington, Herefordsh.
Langdale, Hon.C...Houghton Hall, Market Weighton
Langdale, Sampson....Newton Red Ho., Morpeth
Langdale, Wm. Atkinson...Holmwood Pk., Dorking
Langdon, William...Ashford House, Barnstaple
Lange, W. J. M....West Ho., Whitburn Sunderland
Langham, Herbert...Cottesbrooke, Northampton
Langlands, John Charles...Old Bewick, Alnwick
†Langton, W. H. P. Gore, M.P....Newton Pk., Bath
Lansdowne, Marquis of....Bowood, Calne
Large, William....Taywell House, Goudhurst
†Lascelles, Hon. G. E...Moor Hill, Harewood, Leeds
La Touche, Col. David...Marlay, Dublin
Latham, Geo. William...Bradwall Hall, Sandbach
Lathbury, George....Wetmoor Hall, Burton-on-Tr.
Lauder, Joseph...Burton, Christchurch
Laverach, Samuel S....Redness Hall, Goole
Laverack, Samuel....Chapel Haddlesey, Selby
†Law, Rev. R. V....Christian Malford, Chippenham
Lawes, J. Bennet..Rothamsted Park, St. Albans
†Lawford, Thomas, jun....London, Canada West
†Lawley, Hon. & Rev. S. W...Escrick Rectory, York
Lawrence, Charles...Cirencester
Lawrence, J....Great House, Churchdown, Gloucest.
Lawrence, Thomas...Churchdown, Gloucester
†Lawrie, Andrew...Mount Mascal, North Cray
†Lawson, C...George the Fourth Bridge, Edinburgh
†Lawson, Chas., jun...34, George Square, Edinburgh
Lawson, E...Redesdale Cottage, Newcastle-on-Tyne
Lawson, Rev. Edw....Longhirst Hall, Morpeth
Lawson, Wilfrid, M.P....Brayton, Carlisle
Lawson, Sir Wm., Bart....Brough Hall, Catterick
†Lawson, William...Brayton Hall, Carlisle
Lax, William...East Heaton, Newcastle-on-Tyne
Lay, Rev. John Ward...Hele, Ashburton
†Lay, John W...3, Savage Gardens, Tower Hill, E.C.
Laycock, Joseph...Seghil House, Northumberland
Laycock, Richard....Winlaton, Newcastle-on-Tyne
Laycock, Robert....Winlaton, Newcastle-on-Tyne
Laycock, Rt., jun....Low Gosforth, Newc.-on-Tyne
Layton, R. Marton...Thorney Abbey, Peterborough
Lea, John Wheeley...Stanfield House, Worcester
Leach, Henry...Corston, Pembroke
Leach, John...Ivy Tower, Tenby
Leader, Nicholas...Dromagh, Bonteen, Ireland
Leathart, Jas...12, Framlington Pl., Newc.-on-Tyne
Leather, George...Knostrop, Leeds
Leather, Simeon...Delamere, Northwick
†Leaver, Francis...Longnor Hall, Penkridge
†Lechmere, Sir E. A. H., Bt....Upton-on-Severn
Le Cornu, Charles Philip...Beaumont, Jersey
Ledger, Reuben..Grove House, W. Derby, Liverpool
Lee, Charles...Grantley Hall, Ripon
Lee, Daniel Jas....4, Bedford Row, Gray's Inn, W.C.

Lee, Edward...Stocksfield Hall, Newcastle-on-Tyne
Lee, Jesse...Church Gate, Leicester
Lee, Capt. John...Woolley Firs, Maidenhead
Lee, John Bunting...Stocksfield Hl., Newc.-on-Tyne
Lee, Joseph...Dilston, Hexham
Lee, Joseph Henry...Redbrook, Whitchurch, Salop
†Lee, J. Lee...Dillington House, Ilminster
Lee, Matthew...Wester Hall, Hexham
Lee, Thomas...78, Westbourne Park Villas, W.
†Lee, Vaughan H....Lanelay, Llantrissant, S. Wales
Leech, John...Wall Hill, Leek
Leedham, William...Andover
Leeds, Henry...Stibbington, Wansford, Northampt.
†Leeds, Robt....Lexham, Castleacre, Brandon
Leeke, R....Longford Hall, Newport, Shropshire
Lees, John...Reigate
Lees, William...Blacon Hall, Chester
Leese, Benjamin...Eastling, Faversham
Leese, Chas. Stewart...Divan Ct., Eastling, Faversh.
Le Feuvre, H. J....Les Nièmes, St. Peter's, Jersey
Le Gallais, Albert...La Moire House, Jersey
Legard, George...Easthorpe Hall, Malton
Legard, Capt. James A....Cowes
Legg, Thomas...Burton Bradstock, Bridport
Leggatt, H. B....Brownwich, Fareham
Leggatt, S. B....Crofton, Titchfield
Legge, Benj....Court Ho., Litton Cheney, Dorchester
Legh, G. Cornwall, M.P....High Leigh, Warrington
Le Grand, Emile...Woodhorn, Morpeth
Leigh, F. A...Rosegarland, Foulksmill, co. Wexford
Leigh, John Gerard...The Hoo, Luton
Leigh, John Shaw...The Hoo, Luton
Leigh, W., jun....Woodchester Park, Gloucestershire
Leighton, Sir Baldwin, Bt., M.P....Loton, Shrewsb.
Leighton, Robert...Thistleyhaugh, Morpeth
Leir, Rev. W. M....Ditcheat Rectory, Castle Cary
†Leith, Sir A., Bt...Glenkindie, Iverkindie, Aberdn.
Lempriere, Rev. William...Royal Manor, Jersey
Leney, Charles...Lenner, East Peckham, Kent
Lennard, Col. J. F....Wickham Court, Bromley
†Lennard, Sir T. B., Bt...Belhus, Avely, Romford, E.
Lennox, William...Six Mile Bridge, Newc.-on-Tyne
Leonard, Charles...Castle Camps, Linton, Cambs.
Leslie, Charles Powell...Glasslough, Ireland
Lethbridge, Ambrose Goddard...Bank, Taunton
†Lethbridge, Charles...Eastbrook House, Taunton
Levett, William...Glassenbury, Cranbrook
Lewes, Col. John...Llanliar, Talsarn, Carmarthen
Lewes, Rev. Thomas...Taynton, Burford, Oxon
Lewis, David...Stradey, Llanelly, Carmarthen
Lewis, Edward...Pickhill Hall Farm, Wrexham
Lewis, G....Audley, Newcastle-under-Lyme
Lewis, I. H....Gallants Ct., East Farleigh, Maidstone
Lewis, J. L. G. R....Henllan, Narberth, Pembroke
Lewis, Rich. Ed...Weston, Monk Hopton, Bridgnth.
Lewis, S....Audley, Newcastle-under-Lyme
Lewis, Thomas...Norchard, Tenby
Lewis, T. F....Newport, Monmouthshire
Lewis, W. H....Clynfiew, Newcastle Emlyn
Lewis, Wyndham W....Llanishew House, Cardiff
Ley, John Henry...Trehill, Exeter
Leyshon, Robert...Island Farm, Bridgend
Lichfield, Earl of...Shugborough, Staffordshire

ll, Annie...Newcastle-on-Tyne
ll, Edward...Jesmond, Newcastle-on-Tyne
ll, F. L...University College, Oxford
, James...Bassingbourn, Royston
n, P....Norton Hill, Preston Brook, Cheshire
ley, Urban...Radmanthwaite House, Mansfield
ey, Hugh H....West Dean House, Chichester
ey, Col. R. Lloyd...Lockinge, Wantage
ell, Lieut.-Col...Fairfield House, Biggleswade
y, William...Sutton, S.
n, Rev. J....Hemingford Ho., St. Ives, Hunts
n, John...Westwick House, Cambridge
ett, Wm....Holmbush, Slinfold, Horsham
n, Robert G....Jermyns, Romsey
r, Clement..West Elswick Villa, Newc.-on-Tyne
field, John...Epperstone, Nottingham
le, Edward...Lanhill, Chippenham
le, Hack Magnus...Elmington, Oundle
n, Wm. H....Llanvair Grange, Abergavenny
dale, Harold...Liscard, Liverpool
dale, Henry...Cardington, Bedford
sey, Rev. Thos....Stourton Hall, Horncastle
wellin, R...Tregwynt, Fishguard, Pembrokesh.
ellyn, Wm....Courtcolman, Bridgend, S.Wales
yd, Arthur P....Shawbury, Shrewsbury
yd, Edw. Harvey...Aston Hall, Oswestry
yd, Francis...Foundry, Worcester
yd, George Woodhall...Whitchurch, Monmouth
yd, John...Astwich Manor House, Hatfield
yd, J. A....Leaton Knolls, Shrewsbury
yd, Llewellyn F....Nannerch Hall, Mold
yd, Rev. Thos....Rectory, Christleton, Chester
yd, William Butler...Monkmoor, Shrewsbury
der, J....Firgrove Farm, Whitchurch, Hants
bb, Geo., jun....Lawhitton, Launceston, Cornwall
cker, Wm. J....Tillington House, Stafford
cock, Sir C., Bt....Holmewood, Tunbridge Wells
cock, Edmund...South Elkington, Louth
cock, Fred....26, Hertford Street, May Fair, W.
sch, H....Cammerswaldau, Hirschberg, Prussia
n, J...Maindee House, Newport, Monmouthsh.
desborough, Lord...Grimston, Tadcaster
g, Alexander Wearing...Mint Cottage, Kendal
g, Daniel...Waddon, Gloucester
g, H. Laws...Hampton Lodge, Farnham, Surrey
ng, Kellett...Dunstan Hall, Norwich
ng, Rich. P....Dolforgan, Newtown, Montgom.
g, Walter...Preshaw House, Bishop's Waltham
g, W. Jervis...Preshaw Ho., Bishop's Waltham
ngbourne, W. T...4, South Sq., Gray's Inn, W.C.
ngcroft, C. J....Havant
gcroft, C. R....Llanina, Aberayron
ge, John...Spixworth Park, Norwich
ngford, Earl of...Packenham Hall, Westmeath
gland, James...Grendon, Northampton
mes, Edward...Whittlesea, Cambridgeshire
pes, Sir Massey, Bart., M.P...Maristow, Plymouth
ine, Edward...The Riding, Newcastle-on-Tyne
d, John...Elmley Park, Pershore
l, Capt. John P....Hallow Park, Worcester
h F. Wm. B....
aine, Lord...Albury Park, Guildford
Peter...Northampton

Love, Samuel...Castle Farm, Shoreham, Sevenoaks
Loveday, John...Williamscote, Banbury
†Lovell, Edward W. L....The Meads, Eastbourne
†Lovell, Edwin...Dinder, Wells, Somerset
†Lovell, Thomas...Winwick Warren, Rugby
Lovett, Joseph Venables...Belmont, Chirk
Lowe, Edward...Comberford Mill, Tamworth
Lowe, John...Ryhall, Stamford
Lowe, John...Whitmore House, Birmingham
Lowe, John...Bridge Farm, Handley, Chester
Lowe, John...Wheelock Heath, Sandbach
Lowe, Joseph...Stackton Hall, Malpas
Lowe, Peter...Marston, Stafford
Lowe, Thomas...Calverley Hall, Handley, Chester
†Lowndes, Geo. Alan...Barrington Hall, Harlow
†Lowndes, W. L....Linley Hall, Bridgnorth, Salop
Lownds, J. R....Dene Ho., Walker, Newc.-on-Tyne
Lowrey, E....Broomhaugh, Riding Mill, Northum.
Lowrey, Wm....Barmoor, Berwick-on-Tweed
Loxley, John Dingley...Charlton, Pershore
†Loyd, Ed., jun...Litlesden Ho., Hawkhurst, Kent
†Loyd, Wm. Jones...Langleybury, Watford
†Lubbock, Sir J. Wm., Bt....High Elms, Farnboro'
Lucan, Earl of...36, South St., Grosvenor Sq., W.
†Lucas, Bernard...Chesterfield
Lucas, George...Filby House, Great Yarmouth
†Lucas, Lieut. Richard...Edith Weston, Stamford
Luckock, Howard...Oak Hill, Edgbaston, Birmingh.
Luckham, Levi...Broadway, Weymouth
Lucy, Rev. J....Hampton Lucy, Stratford-on-Avon
Ludlow, H. G. G....Heywood House, Westbury
Ludolf, Henry...Headingley Lane, Leeds
Luff, John W....Canford, Wimborne
†Lugar, Henry...Hengrave, Bury St. Edmund's
Lumley, Robert...Black Hedley, Shotley Bridge
Lund, Capt. Thos....Lovely Hall, Blackburn
Lungley, Brooke M...Peyton Hall, Boxford, Suffolk
Lunn, Robert...Norton, Evesham
†Lupton, Arthur...Newton Hall, Leeds
Lurgan, Lord...Brownlow Ho., Lurgan, Armagh
†Lushington, C. Manners...
Lutener, Thomas...Keele, Newcastle, Staffordshire
†Lutteroth, Robert...Hamburgh
Luttrell, Rev. Alex. H. F....Minehead, Taunton
†Lyall, William...Balmakervian, Montrose, N.B.
Lyell, Thomas...Shiehill, Kirriemuir, N.B.
Lyne, Charles, R.N...Newport, Monmouthshire
†Lyne, Robert L....Oddington, Stow-on-the-Wold
Lyne, Wm....Oddington, Stow-on-the-Wold
†Lynes, G. Boulton...Hackleton Ho., Northampton
Lynn, John...Church Farm, Stroxton, Grantham
Lyon, Capt. T. D....
Lysley, Wm. John...Mimwood, Potter's Bar, Herts.
Lyveden, Lord...Farming Woods, Thrapstone

M.

Mabbett, John...Stinchcombe, Dursley, Gloucester
Maberley, Hon. Mrs....Shute House, Axminster
M'Cann, George...Court Farm, Malvern
McChesney, J. H....Newcastle-on-Tyne
†Macclesfield, Earl of...Sherburn Castle, Tetsworth

MacClintock, Maj. H. S...Randalstown, Antrim
MacConneil, F....Robgill Tower, Ecclefechan, N.B.
†MacDonald, Sir A. K., Bt..Woolmer Lodge, Liphook
MacDouall, Col. James...Logan, Stranraer, N.B.
†MacDougall, A. H....44, Parliament Street, S.W.
†MacDowall, J. C. S...Sydney, New South Wales
Mace, J. Ellis...Ashford Road, Tenterden, Kent
MacGregor, Duncan...Eccleston, Chester
†MacEwen, James...Clonshire, Croagh, Limerick
McGeorge, John...Goudhurst, Staplehurst
Machin, J. Vessey...Gateford Hall, Worksop
Mack, A....Livers Acle, Hereford
Mackay, Thos. Henry...Petham House, Canterbury
†Mackenzie, E....Fawley Court, Henley-on-Thames
†MacIntosh, David...Havering, Romford, E.
Mackenzie, John...Worcester
Mackinder, Herbert...Mere Hall, Lincoln
†MacLagan, Peter...Pumpherstone, Midcalder
McLaren, Henry...Hylton Castle, Sunderland
M'Laren, James...
McLaren, Peter...West House, Marley Hill
McLaren, Wm....North Gosforth, Newc.-on-Tyne
McLaughlin, W. G....Duncombe Park, Helmsley
Maclean, Allan, M.D....Colchester
†Macleod, Norman...
†MacNiven, Charles...Perrysfield, Oxted, Surrey
MacRae, Dr. A...The Priory, Kemerton, Tewkesb.
Madan, M....Brant, Broughton, Newark-on-Trent
†Maddison, George Wilson...Partney, Spilsby
Maddison, R. T....Wandon, Belford
Maddock, Henry...Sealand, Chester
Maddox, John...Harley, Much Wenlock
†Madgwick, Wm., jun....Alciston, Lewes
†Mahon, H. J. P...Strokestown House, Roscommon
Maidens, Thomas Cousins...Brinkhill, Spilsby
Main, James...13, Rye Hill, Newcastle-on-Tyne
†Mainwaring, Townshend...Galltfaenan, Denbigh
†Maitland, Col. Fred. Thos...Babbicombe, Torquay
†Maitland, J. G....Surrey Villa, Lambeth, S.
Majendie, Ashhurst...Castle Hedingham, Essex
Makgill, George...Prestbury, Cheltenham
†Malcolm, Maj.-Gen. G. A...67, Sloane Street, S.W.
†Malcolm, John...7, Great Stanhope Street, W.
Malcolm, M....Manor House, Kineton, Warwicksh.
Male, Henry...East Chinnock, Yeovil
Malloch, C. H....Court House, Cockington, Torquay
Malmesbury, Earl of...Heron Court, Christchurch
†Maltby, Edward Harvey...G 3, Albany, W.
†Manchester, Duke of...Kimbolton Castle, Hunts
†Mangles, F....Down Farm, Compton, Guildford
Mangles, George...Givendale Grange, Ripon
Mangles, Ross D....Stoke, Guildford
Mann, Henry...The Asps, Warwick
Mann, H....9, Woburn Buildgs., Euston Sq., N.W.
Mann, John...Thornage, Thetford
Manning, Henry...251, High Holborn, W.C.
Manning, John...Orlingbury, Wellingborough
Mannings, George...Downton, Salisbury
†Mannsfeld, Count...Dobrisch, Prag, Austria
Mansel, J. C....Whatcombe, Blandford, Dorset
Mansel, Raleigh A...Heathfield, Swansea
†Mansell, Sir John, Bart....Maesdeilo, Llandilo
Mansell, Thomas...Adcott Hall, Baschurch Salop

Mapplebeck, W. B....6, Bull Ring, Birmingham
March, Thomas...Blaydon Bank, Blaydon-on-Tyne
†Margary, Maj. A. R....Chartham Pk., E. Grinstead
Margesson, Rev. W...4, Green's Row, Chelsea, S.W.
Margetson, James...Manor House, Shalden, Alton
†Margetts, Charles...Huntingdon
Margetts, John...High Street, Warwick
Marjoribanks, E...Greenlands, Henley-on-Thames
†Marjoribanks, D. C....Bushey Hall Farm, Watford
†Marjoribanks, Edward, jun....59, Strand, W.C.
†Marjoribanks, Stewart M.P...Bushy Grove, Watford
Markby, John Randall...9, Whitehall Place, S.W.
†Markham, Charles, jun....Northampton
Markham, Lt.-Col. W. T...Becca Hall, Milford June.
Marmont, James...Bristol
Marriage, John...Grassmere, Mitcham, S.
Marriott, Capt. E. J. Beckett..Avon Bank, Pershore
Marriott, H. C....Narborough, Brandon
Marriott, Rev. J. P....Cotesbach, Lutterworth
†Marriott, W. M....Kibworth, Market Harborough
Marris, Thomas...Ulceby, Lincolnshire
Marsh, Matthew H., M.P....Chilbury Ho., Salisbury
Marsh, Richard...Sandwich
Marsh, Thomas...The Heamies, Stone, Staffordshire
Marsh, Wm. Jas....Loridge, Berkeley, Gloucestersh.
†Marshall, Arthur...Headingley, Leeds
Marshall, Rev. C...Ripley Court, Ripley, Surrey
†Marshall, Edmond H....Westwood Hall, Leeds
Marshall, Fred. Chas....Riseholme, Lincoln
†Marshall, Geo. H....32, St. George's Rd., Pimlico
Marshall, H. J....Poulton Priory, Cricklade
Marshall, James...West Hartford, Bedlington
†Marshall, James Garth...Headingley, Leeds
Marshall, John...Eden Lodge, Beckenham, S.E.
Marshall, T. Bumpstead...Branston, Lincoln
Marshall, Wm....Bolney Place, Cuckfield,
Marsham, R., D.C.L....Merton College, Oxford
Marson, W....Acton Trussell, Penkridge
Marten, Peter...Chilham, Canterbury
Martin, Chas. W., M.P....Leeds Castle, Maidstone
Martin, David...Wainfleet, Lincolnshire
Martin, E. Hall, jun....Barr Hill, Madeley, Staffs.
†Martin, E. Waterer...Nonsuch Park Farm, Ewell
†Martin, Fran. P. B...Oxford & Cambridge Cl., S.W.
†Martin, Gilson...Thorney, Peterborough
Martin, Henry B....Colston Basset, Bingham, Notts
Martin, Robert...Asterby, Horncastle
Martin, S. D....1, Park Place, Leeds
Martineau, R....Walsham-le-Willows, BurySt.Edm.
†Masfen, R. Hanbury...Pendeford, Wolverhampton
Mashiter, Thomas...Priest's, Romford, E.
†Mason, C. A....Tarrington, Ledbury, Herefordsh
Mason, Capt. Geo....Manor House, Yateley, Hants
Mason, Matthew...9, Portland Place, Brighton
Mason, Richard...Keddington, Louth
Mason, Col. Wm....Necton Hall, Swaffham
Massey, Sampson...Harkstone, Derby
Massey, Samuel...Lawton Arms, Lawton, Cheshire
†Master, Charles H...Barrow Green House, Godstone
Master, Col. Wm. C....Knowle Park, Bristol
Master, Col. Thos. W. C...The Abbey, Cirencester
Masterman, Thos. J....Little Danby, Northallerton
Masterman, T. W...The Hall, Rotherfield, Tun. Wells

Mather, Edward...Jesmond Villas, Newc.-on-Tyne
Mather, Joseph...Newcastle-on-Tyne
Mather, William...Hemscott Hill, Morpeth
†**Matheson, Sir J., Bt., M.P.**..The Lewes Island, N.B.
Mathew, Nath....Wern, Caernarvonshire
Mathews, Augustus...Pitchcombe, Stroud
†**Mathews, Jeremiah**...Edgbaston Ho., Birmingham
Mathews, William...The Leasowes, Birmingham
Maton, Leonard Pitt...Maddington, Devizes
Matson, William...St. Osyth, Colchester
†**Matson, W. Bawtree**...Kentish Bldngs, Boro', S.E.
Matthews, Francis Cook, jun....Driffield
Matthews, Frank...Glyn Moore, Isle of Man
Matthews, Francis Cook...Driffield
Matthews, Henry...Montford, Shrewsbury
Matthews, John, M.D....Tynemouth
Matthews, John...1, Cross Street, Whitehaven
†**Matthews, Thomas**...Sporle, Swaffham
Maud, Chas. T....Manor House, Bathampton, Bath
Maude, Wm. E....Holmscales, Milnthorpe
Maughan, Robert...Oxford St., Newc.-on-Tyne
Maunsell, Thomas P....Thorpe Malsor, Kettering
Maw, H. Lister...Tetley, Crowle, Isle of Axholm
Maw, Mathew...Cleatham, Kirton-in-Lindsey
Mawson, John...Newcastle-on-Tyne
Maxwell, Sir J. H., Bt....Springkell, Ecclefechan
Maxwell, Hon. M. Constable...Terregles, Dumfries
Maxwell, Wellwood...Munches, Dalbeatie, N.B.
May, Charles N....Devizes (North Wilts Foundry)
May, George Anderson...Elford Park, Lichfield
May, John...London Road, Reading
Mayall, John E...The Grove, Pinner, Watford
Maynard, Robert...Whittlesford, Cambridge
Mead, Wm. Rich....Ballymartle, Kinsale, Cork
Mechi, Alderman J. Jos....4, Leadenhall Street, E.C.
†Medlycott, Sir W. C., Bt...Milborne Port, Sherborne
Meeson, Wm. Taylor....Doggetts, Rochford
Mein, William...Brewood, Staffordshire
Meir, Henry...Green Gates, Tunstall, Staffordshire
Meire, Sam....Castle Hill, Harley, Much Wenlock
Meire, Thos. Lockley...Cound Arbor, Shrewsbury
Mellard, James...Rugeley, Staffordshire
Mello, William...Chadwell, Ware
Mellows, William...High Melton, Doncaster
Melville, Hon. A. Leslie...Branston Hall, Lincoln
†Melville, Alex. S. Leslie..Branston Rectory, Linc.
†Melville, Charles Leslie...Branston Hall, Lincoln
Melvin, James...Bonnington, Ratho, Edinburgh
Mercer, F....28, Clayton St. West, Newc.-on-Tyne
†Mercer, James, M.D....
†Mercer, William...Newton, Warrington
Mercer, William...Grove Ho., Hunton, Staplehurst
Meredith, J...The Hildre, Halfway H., Shrewsbury
†Merriman, Thomas Baverstock...Marlborough
†Merriman, Wm. Clark...Lockeridge, Marlborough
Merson, Jas....Brinsworthy, North Molton, Devon
†Mertens, Baron Edward...Rue Ducale, Brussels
†Metcalfe, C. J...
†Methley, W....24, Soho Square, W.
Meux, Sir H., Bt...Theobald's Pk., WalthamCross, N.
†**Meyer**, Herman...Little Laver Hall, Ongar
†**Meyer**, James...Forty Hall, Enfield, N.
†**Meyer**, P. Herman...Stondor Place, Brentwood

Meyrick, Owen Fuller...**Bodergan, Anglesey, N.W.**
Michell, John...**Forcett Park, Darlington**
†Micklethwaite, Rev. J....**Iridge Pl., Hurst Green**
Middleborough, J. R....**South Milford, Milford Junc.**
†Middleton, Henry...**Cutteslowe, Oxford**
Middleton, **Saville**...**Water Newton, Hunts**
†Midgley, W. H....**Bryntirion, Corwen, Merioneth.**
Midworth, John...Newark-on-Trent
Milbank, Sussex...Barningham Park, Darlington
†Mildmay, Sir H. St. J. Bt..**Dogmersfield Pk., Winchfld**
Mildmay, Humphrey, M.P....**Shoreham, Sevenoaks**
†**Miles, Charles W...Burton Hill, Malmsbury**
†**Miles, John Wm....King's Weston, Bristol**
†**Miles, Grosvenor...Bourton House, Rugby**
†**Miles, P. W. S....61, Queen's Square, Bristol**
Miles, **Roger Dutton...Keyham, Leicester**
Miles, Thomas...Keyham, Leicester
†Miles, William...Dix's Field, Exeter
Miles, Wm. **Marsh...Fragham, Nonington, Wingham**
Milford, **Thos....Thorverton, Cullompton**
†Miller, **Bartlett...Moulton, Northampton**
Miller, George...**Barnstaple**
Miller, George...**Gateshead**
Miller, G. Seymour...**Bradpole, Bridport**
Miller, Samuel...**The Court, Abermule, Montgom.**
Miller, **Thomas...Pictree House, Fence Houses**
Mills, John F....**Westwell, Burford, Oxon**
Mills, John...**Bisterne, Ringwood**
Mills, John...**Pinkneys Green, Maidenhead**
†**Mills, J. R....Englefield Green, Surrey**
Mills, R. W. F....**Dunnington, York**
†Mills, Wm....Saxham Hall, Bury St. Edmund's
Milne, David...Milne Garden, Coldstream, N.B.
Milne, Oswald, jun....Woodville, Leamington
Milner, Sir W. M. E., Bart...Manappleton, Tadcaster
Milnes, James...Alton Manor, Wirksworth, Derbys.
Milvain, Ed. D...14, Elswick Villas, Newc.-on-Tyne
Milward, Dawson A....Tullogher, New Ross
Milward, Richard...Thurgarton Priory, Southwell
Minet, Charles Wm....41, West Smithfield, E.C.
Minett, Junius E....Arley, Coventry
Minor, A. H....Astley House, Shrewsbury
Minor, John...Fern Hill, Market Drayton
Minton, Alfred...Windsor
Mitchell, Andrew...Alloa, Clackmannanshire, N.B.
Mitchell, John...Wymondham, Norfolk
Mitchell, J. Hoffe...Witchampton, Wimborne
†Mitford, Wm. Townley, M.P....Pitshill, Petworth
Moat, G. Thos...Northumberland St., Newc.-on-Tyne
Molyneux, James More...Losely Park, Guildford
Monck, J. Bligh...Coley Park, Reading
Monckton, E...Hale Place, East Peckham, Tunbridge
†Monckton, E. H. C...Fineshade Abbey, Northamp.
Monins, John...Ringwould, Dover
Monkhouse, Fred. Thos....Dorney Lodge, Windsor
Monkhouse, John...The Stowe, Hereford
Monro, Mordaunt Martin...Enfield
Montagu, G. H....Caversham Hill, Reading
†Monteagle, Lord...Mount Trenchard, Limerick
Montgomerie, F. M...St. Leonard's Ho., St. Leonard's
Montgomery, Rev. R...Holcott Rectory, Northampt.
Moody, Col. R. C....Senior United Serv. Club, S.W.
†**Moore, Rev. Edward...Frittenden, Staplehurst**

Moore, Edward Wells...Coleshill, Faringdon
Moore, George...Appleby Hall, Atherstone
†Moore, Rev. G. Bridges...Tunstall, Sittingbourne
Moore, Henry...Elmsley Castle, Pershore
Moore, James...Monksbury Court, Ledbury
Moore, J. ..11, Upper Berkeley St., Portman Sq., W.
Moore, John...Kerry, Montgomery
Moore, John...Church Street, Warwick
Moore, John...Moor House, Badsworth, Pontefract
Moore, Joseph...Wollaton House, Nottingham
†Moore, Thos. William...Warham, Wells, Norfolk
Moore, Wm....Elm, Wisbeach
Moorsom, C. R....Darlington
Morant, George...Farnborough, Hants
Mordue, Francis...Wallsend, Newcastle-on-Tyne
Mordue, Joseph...Wallsend, Newcastle-on-Tyne
†Morgan, Maj. G. C., M.P....Rupera Castle, Cardiff
Morgan, Roger...Llanellen, Abergavenny
Morgan, John...Market Square, Shrewsbury
Morgan, M..North Bondgate, Bishop Auckland
Morgan, Thomas...Burnt House, Waltham Cross, N.
Morison, John Alex., M.D....Portcleu, Pembroke
Morland, George Bowes...Abingdon
Morland, W. Courtenay..Court Lodge, Lamberhurst
†Morley, John...
Morley, John...Broughton Lodge, Manchester
Morley, John...Effingham Hill, Dorking
Morley, Robert...Birkbeck, Northallerton
Morley, William...Brize Norton, Faringdon
†Morrell, Frederick J....St. Giles's, Oxford
Morrell, James...Headington Hill, Oxford
Morrell, James Conyers...Leyland, Lancashire
†Morrice, J. W....The Tower, Calthorpe, Rugby
Morris, Abiathar...Pendeford, Wolverhampton
Morris, E. John....Stanley Pontlarge, Winchcombe
Morris, John...Town House, Madley, Hereford
Morris, John...Wightwick House, Wolverhampton
†Morris, Col. Lewis G....Morrisania, New York
†Morris, Norman...The Warren, Edenbridge
Morris, Philip S....Woodmanton, Worcester
Morris, Richard...Knockin Heath Farm, Oswestry
†Morris, Thos., jun....Walcote Fields, Lutterworth
Morris, Thomas...Maisemore, Gloucester
Morris, Walter...Dewsal Court, Hereford
Morris, William...Carmarthen
Morris, Wm. C...Whitwick, Lower Eagleton, Ledbury
Morris, Lieut.-Col. W. J...Heppington, Canterbury
Morris, W. Rudkin...North Luffenham, Leicester
†Morrison, Charles...Basildon Park, Reading
†Morrison, Frank...Hole Park, Tenterden
Morrison, R...Shielfield House, Newcastle-on-Tyne
†Morrison, Walter, M.P....Malham Tarn, Skipton
Morriss, N....Blue Ho., Washington Stat., Durham
Morrow, Hugh...Coraboold House, Longford
Morse, Joseph Ramey...Lound, Lowestoft
Morshead, Sir Warwick, Bt....Forest Lodge, Binfield
Morton, Henry Thomas...Biddick, Fence Houses
Morton, Hugh...Leith, Edinburgh
Morton, John Chalmers...Streatley, Reading
†Morton, J. D....83, St. George's Road, S.W.
Moscrop, W. J....Kirkleatham, Redcar
Moseley, Henry...Westhide Court Farm, Hereford
Mosley, Sir O., Bt...Rolleston Hall, Burton-on-Trent
Mosley, Tonman...East Lodge, Burton-on-Trent
Moss, D. Topham...16, Camden Terrace, Leeds
Moss, Henry...Bentley Hill, Brentwood
Mostyn, Sir P., Bt....Talacre, Holywell, Flintshire
†Mott, Charles John...Lichfield
Mott, Thomas...Much Hadham, Ware
Mott, William...Wall, Lichfield
Moult, Wm....Knowsley, Prescot, Lancashire
Mount Edgecumbe, Earl of...Mt. Edgecumbe, Cornw.
Mount, Thomas...Saltwood, Hythe
Mount, William...Wasing Place, Reading
Mourant, Edward...Samare's Manor, Jersey
Mousley, Geo....Hooton Hall, Chester
Moxon, William...3, St. Martin's Place, W.C.
†Moysey, H. G....Batheaton Court, Wiveliscombe
Muckle, Robert...Cresswell, Morpeth
†Muggeridge, Sir Henry, Kt....Ashurst, Dorking
Mulkern, Edmund Cowell...Leighfield, Ockley
Mulliner, Job...Royton Farm, Wrexham
Mumford, George S....Lavenham, Sudbury
†Mumford, Maurice...Creeting, Stowmarket
Mumford, Richard...Chilton Park Farm, Thame
Mumford, William...Credenhill, Hereford
†Mumford, William Henry...
Mundy, William...Markeaton, Derby
†Munn, Fred....Temple Laugham, Worcester
†Munn, Maj. W. A....Throwley House, Faversham
Murdoch, James Gordon...1, Pall Mall East, S.W
†Murray, Alex....Worlington Hall
Murton, Frederick...Smeeth, Ashford
Murton, Walter...East Stour, Ashford,
Murton, William...Tunstall, Sittingbourne
Musgrave, John...Pocklington
Musgrave, Simeon...Market Weighton, Yorkshire
†Musgrave, Sir Geo., Bart....Edenhall, Penrith
Musgrave, Rev. Vernon...Hascombe, Godalming
Muskett, Chas....Bressingham House, Diss
Muspratt, S., M.D...Royal Coll. Chemistry, Liverpool
Myers, Christopher...Dunston, Gateshead
†Mynors, R...Weather Oak, Alvechurch, Bromsgrove
Myott, James...Copesthorne, Congleton
Myott, Richard...Lower Overton, Congleton
Mytton, Thos...Shipton Hall, Much Wenlock

N.

Nainby, Charles M...Barnoldby, Grimsby
Nainby, Richard...Barnoldby, Grimsby
†Naish, W. B....Stoneaston, Bath
Naper, Jas. L., jun....Loughcrew, Oldcastle, Ireland
†Napier, Edw. B....Pennard House, Shepton Mallet
Napier, Hon. William...2, Old Palace Yard, S.W.
Napper, John...Ifold, Horsham
Nash, Charles...Royston
Nash, Daniel...4, York Gate, Regent's Park, N.W.
Nash, John...Reed-court, Rochester
†Nathusius, Baron...Hundisburg
†Naylor, John...Liverpool
†Naylor, Rich. Christopher...Hooton Hall, Chester
Neale, Charles...Mansfield Woodhouse, Notts
Neale, Charles.....New Field, Newark

Neale, Charles James...Mansfield, Notts
Neame, Charles...Woodlands, Selling, Faversham
†**Neame, Edward**...Selling Court, Faversham
Neame, Frederick...Macknade, Faversham
Neame, Percy B....Swanton Lodge, Lydden, Dover
Neate, John Reeks...Northington Farm, Overton
Neave, Sir Digby, Bart..Dagenham Pk., Romford, E.
Neave, Sheffield...Oakhill House, Hampstead, N.W.
Needham, F. Haywood...Fearnall Heath Ho., Worc.
Needham, W. B....Fearnall Heath Ho., Worcester
†**Negus, Thomas A.**...Lynn House, Walsall
†**Neild, Wm.**...Mayfield, Manchester
Neilson, Thomas...Regent Terrace, Gateshead
Nelmes, William...Pembridge Castle, Monmouth
Nelson, Wm. M....Cardigan Place, Leeds
Nesham, David...Houghton-le-Skerne, Darlington
Nesfield, R. M. N....Castle Hill, Bakewell
Nethercoat, John...Moulton Grange. Northampton
Neve, Charles...Shepway Court, Maidstone
Neve, George...Sissinghurst, Staplehurst
Neve, Thomas...Benenden, Staplehurst
Nevett, Wm...Yorton Villa, Harmer Hill, Salop
†**Nevile, Rev. Christopher**..Thorney, Newark, Notts
†**Nevile, George**...Shebton, Newark-on-Trent
†**Nevill, Viscount**...Hope Hall, Tadcaster
Nevill, Thos...Montford, Shrewsbury
Neville, Samuel..Newcastle-on-Tyne
New, David...Waverley House, Nottingham
New, Richard...Hartpury, Gloucester
Newall, Mary..Fern Dean, Gateshead
Newall, R. S...Fern Dean, Gateshead
Newall, Wm...Fern Dean, Gateshead
†**Newbery, Rich. Phelps**...Challenger, Axminster
Newcastle, Duke of...20, Portman Square, W.
Newcombe, Fred...Ravensworth, Gateshead
Newdegate, C. N....Arbury, Coventry
†**Newdigate, F.W.,M.P.**..Byrkley Lge., Burton-on-Tt
Newill, Joseph...Walcot, Lydbury, Shropshire
Newill, Thos...Spring Bank, Welshpool
Newill, Thos., jun...Montford, Shrewsbury
†**Newman, J.**...Brands Ho., High Wycombe, Bucks
Newman, Thomas...Lyn Court, Mamhead, Exeter
Newman, Thomas...Cray's Marsh Farm, Melksham
Newport, Viscount...30, Wilton Crescent, S.W.
Newsome, W.....
Newton, Chas. Ed...Mickleover, Derby
†**Newton, G. Onslow**....Croxton Park, St. Neot's
Newton, John...Grove Lodge, York
Newton, John...Chollerton, Hexham
Newton, Joseph...3, Melbourne St., Gateshead
†**Newton, R. J.**...Campsfield, Woodstock
†**Newton, Thomas**...The Cedars, Mitcham Cmmn., S.
Newton, Thos. H. G...Barrell's Park, Birmingham
Nicholay, J. A....Cumberland Mills, Isle of Dogs, E.
Nicholls, John S....Buckland, Lymington
Nicholls, Lambert...Howsen, Cotheridge, Worcester
Nicholls, Wm....Chippenham
Nichols, Ben....West End Farm, Aldershot
Nichols, George...Spa Gardens, Leicester
Nicholson, Brady...Stourton Grange, Leeds
Nicholson, Charles ..Staniwells, Brigg
Nicholson, Geo....Winlaton, Blaydon-on-Tyne
†**Nicholson, James**...Blencairn Hall, Penrith
Nicholson, J....Kirkby Thore Hall, Westmoreland
Nicholson, John...Barford St. Martin, Salisbury
Nicholson, Capt. S....Waverley Abbey, Farnham
†**Nicholson, William**...4, Sussex-square, W.
Nicholson, Wm. Newzam...Newark-upon-Trent
Nickisson, John...Stone, Staffordshire
Nicks, John...Leek Wootton, Warwick
Nicol, James Dyce...5, Hyde-Park Terrace, W.
†**Nightingale, Vaughan E.**...Burway, Ludlow
†**Nightingale, W. E.**...Embley, Romsey
Nisbet, Ralph P....Row Wood, Chalfont St. Giles
Nixon, William...Union Hall, Newcastle-on-Tyne
†**Noakes, John Tompsett**..Brockley Ho., Lewisham
Nock, Thomas....Sutton Maddock, Shiffnal
Nodder, Rev. J....Ashover Rectory, Chesterfield
Noel, Eugène F....36, Westbourne Terrace W.
†**Norman, George Warde**...Bromley, Kent, S.E.
†**Norman, J. Newcomb**...Harborough Magna, Rugby
Norreys, Robt. H....Davy Hulme Hall, Manchester
Norrington, Charles...Cattedown, Plymouth
Norris, Rev. G. P....Roscraddoc House, Liskeard
†**Norris, Wm.**...Wood Norton, Fakenham
North, Chas....South Thoresby, Alford, Lincolnsh
North, Frederick...Rougham, Norfolk
North, Lieut.-Col...Wroxton Abbey, Banbury
†**Northcote, Sir Stafford, Bt., M.P.**...Pynes, Exeter
Northey, Edward Richard...Epsom
Northey, Wm....Lake, Lifton, Devon
Norton, W. F. Norton...Elton Manor, Nottingham
Noton, John...Edensor, Chesterfield
†**Nott, James**...Penn, Amersham, Bucks
†**Nottidge, Josias**...Ramsgate
Nowell, W. A...Netherside, Skipton, Yorkshire
Noyes, Thomas H....Borde Hill, Cuckfield

O.

Oakes, Hervey Asten...Stowmarket
Oakes, Thos. Haden...Riddings House, Alfreton
Oakley, James...Wilford, Nottingham
Oakley, John...10, Waterloo Place, S.W.
Oakley, Richard...Lawrence End, Luton
O'Brien, Stafford...Blatherwycke Park, Wansford
†**Ockleston, Wm. Fairhurst**...Ingon, Strat.-on-Avon
Odams, James...109, Fenchurch Street, E.C.
Oddie, Walter...Pink's Farm, Shenley, Barnet
†**Ogden, John Maude**...Sunderland
Ogilvy, Sir J., Bt....Baldovan House, Dundee, N.B.
Ogle, Charles...Rawcliffe Bridge, Selby
Oldacres, Matthew...Clipston, Market Harborough
Oldacres, Walter...Broad Fields, Lichfield
Oldham, John...Carlton-on-Trent, Notts
Olding, Edmund...Rasfin Farm, Amesbury
Oldrin, John...Rushmere, Wangford, Suffolk
Oliver, James...Hanford, Blandford
†**Oliver, John**...Oxendon, Northampton
Oliver, Robert...Sholbrooke Lodge, Towcester
Oliver, Robert John...Docking, Lynn
†**Olorenshaw, Joseph**...Hatton Grange, Warwick
Onslow, Arthur P....Send Grove, Ripley, Surrey
Onslow, Major P....Dunsbrough Ho., Ripley, Surrey
Ord, Rev. J. A. B....Whitfield Hall, Haydon Bridge

Ord, James...Cloth Market, Newcastle-on-Tyne
Orde, Charles William...Nunnykirk, Morpeth
†Orde, Sir J. P. W., Bt...Kilmorey Ho., Loch Gilp Head
Orlebar, R. L....Hinwicke House, Wellingborough
Ormerod, George...Sedbury Park, Chepstow
Ormerod, Henry Mere...5, Clarence St., Manchester
Ormond, Francis...Blyth, Worksop
Ormston, Robert...Newcastle-on-Tyne
Orton, Francis...Bottisford, Nottingham
†Osborn, G., jun....Manor Ho., Pattishall, Towcester
Osborn, Henry...Weeford Park, Hints, Tamworth
Osborne, Geo....Court Farm, Elberton, Bristol
Ostler, John, jun....Walrond Park, Taunton
Other, Christopher...Elm House, Leyburn, Yorks.
†Otrante, Count A....Nygard, Söderköping, Sweden
†Overman, Henry R....Weasenham, Fakenham
†Overman, John...Burnham, Sutton, Norfolk
†Overman, Robert...Egmere, Walsingham, Norfolk
Owen, B. H. Bulkeley...Tedsmore Hall, Salop
Owen, Richard...Haughton, Tarporley
Owen, Thomas...The Hague, Chesterfield
Owen, William...Blessington, Ireland
Owen, William...Moorgate Hall, Rotherham
Owen, William...Newcastle-on-Tyne
Owen, William...Withybush, Haverfordwest
Owens, Samuel...Whitefriars Street, E.C.
Owsley, Wm. P. Mason...Blaston, Uppingham
Oxford, Bishop of...Cuddesden, Wheatley, Oxon

P.

Pace, Edward Henry...Pershore
Pack, Thomas Henry...Ditton, Maidstone
†Packard, Edward...Ipswich
†Packe, Rev. A....Walton Rectory, Loughborough
†Packe, Geo. H....Caythorpe Hall, Grantham
†Packe, Dr. James...Melton Lodge, Woodbridge
Paddock, Henry...The Trench, Ellesmere
Padmore, Richard, M.P....Worcester
Padwick, Fred....West Thorney, Emsworth, Hants
Page, Bridgewater...West Cliff, Southampton
Page, Edward...Bedford
Page, Henry Robert...Beckenham Place, S.E.
†Page, Henry...Walmer Court, Walmer
Page, Thomas...Tower Cressy, Campden Hill, W.
Page, William, jun....Southminster, Maldon
Paget, C., M.P....Ruddington Grange, Nottingham
Paget, E. Arthur...Thorpe, Leicester
Paget, Lewis...Quenibro', Leicester
†Paget, T. Tertius...Humberstone, Leicestershire
Pain, John...Popham, Micheldever Station
Pain, Philip...Boughton House, Kettering
Pain, Thomas...Laverstock Hall, Salisbury
†Paine, Mrs....Farnham, Surrey
†Paine, Wm. Dunkley...Cockshutt Hill, Reigate
Painter, John...Forest Road, Nottingham
Painter, Thomas...Bodlondeb, Wrexham
Paitson, William...Irish Street, Whitehaven
Pakington, Rt. Hon. Sir John, Bt., M.P...Droitwich
Palin, William...Stapleford Hall, Chester
Palmer, A. S....Willington, Newcastle-on-Tyne
Palmer, C. M....Whitley Park, Newcastle-on-Tyne
†Palmer, Sir Geo. J., Bart....Wanlip Hall, Leicester
Palmer, George...Greenwood, Bishop's Waltham
Palmer, Sir J. H., Bt....Carlton Park, Rockingham
†Palmer, Rev. P. H...Wolsthorp Rectory, Grantham
Palmer, Robert...Bexington, Bridport
Palmer, Thos....Stoke Chingland, Callington
Palmer, Walter James...Pencoyd Court, Ross
†Palmerston, Visc., M.P., K.G...Broadlands, Romsey
Papendick, Bridget Ann...Glasbury Ho., Hay, S.W.
†Papillon, P.O., M.P...Manor Ho., Lexden, Colchester
Papillon, Thomas...Crowhurst Park, Battle
Paramore, J. Rawle...Dinedor Court, Hereford
Parker, Charles L....Ilderton, Alnwick
†Parker, Charles Stuart...Annesley, Liverpool
Parker, F. Sumner...Oxton, Southwell
Parker, Rev. Henry...Ilderton, Alnwick
Parker, Henry...Low Elswick, Newcastle-on-Tyne
Parker, J. O....Woodham Mortimer, Maldon, Essex
Parker, K. S., Q.C...Examiner's Office, Rolls Yd., W.C.
Parker, Capt. R. L...Low Elswick, Newcastle-on-T.
Parker, Rowland...Moss End, Burton, Westmoreld.
Parker, Thomas James...10, George St., Sheffield
†Parker, Wm....Carlton Hill, Penrith
Parker, William...The Park, Ware
Parker, Maj. W., M.P....Clopton Hall, Suffolk
Parker, Rev. W...Rectory, Little Comberton, Pershore
Parker, Rev. W. H....Saham Rectory, Watton, Norf.
Parker, W. H....Newcastle-on-Tyne.
Parkes, T...Warridge Ldg., Grafton Manor, Bromsgr.
Parkin, John...Idridgehay, Wirksworth
†Parkinson, J., jun....Ironmonger Lane, E.C.
†Parkinson, R...Dutton Ldg. Preston Brook, Chester
†Parkinson, Thomas...Hexgreave Park, Southwell
Parkinson, Wilfrid...Ann's Hill, Cockermouth
†Parkyns, Sir Thos. G. A., Bt....Ruddington, Notts.
Parland, John...Stotes Hall, Newcastle-on-Tyne
Parnell, John...Rugby
Parnell, Wm...21, Collingwood St., Newcastle-on-T.
Parr, Samuel...The Poultry, Nottingham
Parrington, John...Brancepeth, Durham
†Parris, John W....Farnham, Bishop's Stortford
Parrott, Thos....Green Bank, Sutton, Macclesfield
Parry, Edward Powell...Morfodion, Llandiloes
†Parry, Joseph, jun....Allington, Devizes
Parry, Nicholas...Little Hadham, Ware
Parson, Rev. W. H...Lynchmere Rectory, Haslemere
Parson, Wm....Rivers Hall, Boxted, Colchester
Parsons, C., jun...N. Shoebury Hall, Rochford, Essex
Parsons, Charles William...Anstrey, Atherstone
†Parsons, Geo....Martock, Somerset
†Parsons, Henry...Haselbury, Crewkerne
Parsons, John...Oxford
Parton, John...Chorlton, Nantwich
Partridge, John...Bishop's Wood, Ross
†Paterson, Geo....Poyle House, Colnbrook, Bucks
†Paterson, Richard...Leesons, Chiselhurst
†Pateshall, Evan...Hereford
Pattenson, Capt. W. H. T....Ibornden, Biddenden
Patterson, John...Hall Beck, Ulverstone
†Patterson, W. J...Durnford Ldg., Wimbledon, S.W.
Pattinson, H. L....Scots House, Newcastle-on-Tyne
Pattison, J. M....Norwood, Gateshead
Pattison, Thomas...Newcastle-on-Tyne

Pattison, T., jun....Newcastle-on-Tyne
Paull, Wm. Joseph...Piddletown, Dorchester
Paver, William...Peckfield, Milford Junction
Pawlett, Thos. Edward...Beeston, Sandy, Beds
†Paxton, Sir Joseph, Bt., M.P...Chatsworth, Bakewell
Paxton, Robert...Lower Winchenden, Aylesbury
Payne, Charles...Newcastle-on-Tyne
Payne, Henry...Birdbrook, Halstead, Essex
Payne, William...Willcott, Nesscliff, Salop
Peachey, Wm....Ebernoe, Petworth
Peacock, Wilkinson...Greatford Hall, Stamford
†Peacock, Warren...Efford, Lymington
†Peacocke, G. M., M.P....33, Hertford St., W.
Pearce, George...Walcot, Pershore
Pearce, Col. Wm....Fauconberg House, Cheltenham
Pears, William...Fenham Hall, Newcastle-on-Tyne
†Pearse, Henry...32, Queen's Gate Terrace, W.
Pearson, T...22, Eldon Street, Newcastle-on-Tyne
†Pease, Joesph Whitwell...Woodlands, Darlington
†Peck, Edmund...Plas-y-Dinas, Shrewsbury
Peel, Edmund...Bryn-y-Pys, Wrexham
Peel, George...Brookfield, Cheadle, Manchester
Peel, John...Middleton Hall, Fazeley
†Peel, Jonathan...Knowlmere Manor, Clitheroe
Peel, Sir R., Bart., M.P....Drayton Manor, Fazeley
Peel, Wm....Taliaris Pk., Llandilo, Carmarthenshire
Peel, William...Trenant Park, Looe, Cornwall
Peel, Xavier...Denant, Haverfordwest
Peele, Henry...17, Princess St., W. Hartlepool
Peers, Joseph...Ruthin
Peile, George, jun....Greenwood, Shotley Bridge
†Peile, Thos. Williamson...Tullihinel, Kerry
Peirson, John...24, Micklegate, York
Pelegrin, Mrs....Newcastle-on-Tyne
Pelegrin, Manuel José...Newcastle-on-Tyne
Pelham, Francis...Norfolk Farm, Windsor Park
†Pell, Albert...Hazelbeach, Northampton
†Pell, Sir Watkin O., Bt....Greenwich, S.E.
Pelly, Sir John H., Bt....Warnham Court, Horsham
Pelly, Capt. R. Wilson...The Willows, Upton, E.
†Pemberton, Rev. R. N....Church Stretton, Salop
†Penn, Granville J....
†Pennant, P. P....Brynbella, St. Asaph
Pennell, H. B....Dawlish
Pennington, Richard...Westfield House, Rugby
Penrice, Thomas...Kilvrough, Swansea
†Peploe, Capt. Daniel Peploe...Garnston, Hereford
Pepper, John...3, Queen Street, Leeds
Pepper, William...Clarendon Mount, Leeds
Peppercorne, H....Bradburn Pk., East Malling
†Perales, Marquis de...Madrid
†Perceval, Chas....West Haddon, Northamptonshire
Percival, Ralph H....Tetton Hall, Middlewich
Peren, W. B....Compton, South Petherton, Somerset
Perkins, C. F....The Grange, Kingston, Taunton
†Perkins, Henry...Thriplow Place, Royston
Perkins, John S....Leek Wootton, Warwick
Perkins, Jos., jn...Laughton, Theddingworth, Rugby
†Perkins, Thomas...Hitchin
†Perry, Thos. A...Betham Ho., Avon Dasset, Banbury
Perry, Sir T. E., Bt., M.P....West Court, Berkshire
Perry, William...Cholstrey, Leominster
Perry, Wm....Alder Lewdown, Exeter
Perry, William J....King's Somborne, Stockbridge
†Perry-Watlington, J. W., M.P....Moor Hl., Harlow
Pertwee, J. F....Rattendon, Wickford, Essex
Peters, Daniel...31, College Green, Bristol
†Peto, Sir S. M., Bt., M.P....9, Gt. George St., S.W.
Phelips, Charles...Briggins Park, Ware
†Philips, Sir G. R., Bart....Shipston-on-Stour
Philips, Mark...Snitterfield, Stratford-on-Avon
Philipson, John...Newcastle-on-Tyne
Philipson, L. W....15, Pilgrim St., Newcastle-on-T.
Phillimore, Edward...Cheltenham
Phillimore, Rev. G....Radnage, Stokenchurch, Oxon
Phillipps, James...Bryngwyn, Ross, Herefordshire
†Phillipps, Robt. Biddulph...Longworth, Hereford
Phillipps, Wm....The Lodge, Reigate
Phillips, Henry R....Willesden, Paddocks, Kilburn
Phillips, J. B....Brockton Leasows, Newport, Salop
Phillips, J. B. Lort...Penty Park, Haverfordwest
Phillips, Rev. John...Ludlow, Salop
†Phillips, J. H....Bradburne Grange, Nawton, York
Phillips, J. R. S....Riffhams, Chelmsford
Phillips, Joseph Taylor...Sheriff Hales Manor, Salop
Phillips, Richard...Brockton Grange, Shiffnal
Phillips, Sir Thos., Knt....Llanellan, Abergavenny
Phillips, Maj.-Gen. Sir T., Knt...Sen. U. S. Cl., S.W.
Phillips, Thomas E....37, Wilton Place, S.W.
Phillpot, Harvey...Weston Ldg., Thames Ditt., S.W.
†Phillpotts, T., jun....Risca, Newport, Monmouthsh
†Phipps, C. Paul...Chalcot House, Westbury
Phipps, Christopher...River, Dover
†Phipps, John Lewis...Leighton, Westbury, Wilts
Phipps, Thomas...Bricklehampton, Pershore
Pickering, Leonard...Wilcot, Charlbury, Oxon
Pickernell, John...Holt Castle, Worcester
†Pickford, William...148½, Fenchurch Street, E.C.
Pickin, W. C....Dunham, Notts
Pickin, Wm. John...Whitemoor, Ollerton, Notts
†Piercy, Alfred...Cold Harbour, Henley, Oxon
†Pierson, Jas. Alex....The Gwynd, Arbroath, N. B.
Piggot, Jas. Algernon...Beckingham Hall, Witham
†Piggott, Geo. G....Doddershall, Winslow
Piggott, Simon Frazer...Fitzhall, Midhurst, Sussex
Pigot, Sir Robert, Bart....Patshill, Wolverhampton
Pike, Aaron...Mitton Farm, Tewkesbury
Pike, James...Reading
Pike, William...Castle Thorp, Stony Stratford
Pilbeam, Thomas...Henham, Wangford
Pilcher, Jesse...Cheriton Court, Hythe, Kent
Pilgrim, Charles H....
Pilgrim, S. C...Manor House, Burbage, Hinckley
†Pilkington, Sir L. M. S., Bart....Wakefield
Pinckhard, George H....Combe Court, Godalming
Pinder, Thomas...Barroby, Grantham
†Pinnegar, C....Rockbourn, Fordingbridge, Hants
Pinney, Col. W., M.P....Somerton-Erleigh, Somers
†Pipon, Capt M....Deerswood, Crawley
Pippet, William...Caughton House, Bromsgrove
Pitfield, A. J...Eype, Symondsbury, Bridport
Pitman, James S....Dunchideock House, Exeter
Pitt, George...Chadnor Court, Dilwyn, Leominster
Pitt, Walter William...Whitchurch, Monmouth
Plaistow, Richard...13, Nixon St. Newcastle-on-T.
Plant, John...Model Mill, Sheffield

Plant, Thomas...Elworth Hall, Sandbach, Cheshire
Platt, Henry...Werneth Park, Oldham
Platt, James...Newton, Malpas
Plowden, W....Plowden Hall, Bishop's Castle, Salop
Plowman, Joseph...Oxford
Plumbe, John...Ashton Keynes, Cricklade
Plumptre, J. B....Goodnestone Farm, Wingham
Plumtre, Charles J....Pedding House, Sandwich
†Pocock, Chas....
Pocock, George...Redbourn Bury, Redbourn
Pocock, W. J. M...Wonston Manor, Micheldever Stat.
Pole, H. Chandos...Barton Fields, Derby
Pole, Sir Peter Van Notten, Bt....6, Up. Harley St., W.
Pole, Rev. Reginald Chandos...Radbourne, Derby
Pollard, George...Dilstone, Corbidge
Pollard, Henry...12, Ellison Pl., Newcastle-on-Tyne
†Pollard, Joseph....Highdown, Hitchin
Pollard, Joseph..12, Ellison Pl., Newcastle-on-Tyne
Pollard, Mrs....Newcastle-on-Tyne
†Pollen, R. H....Radbourne, Chippenham
Pollock, George D....27, Grosvenor Street, W.
Pollock, J. O. G...Mountain's Town, Navan, Ireland
†Polwarth, Lord...Mertown Ho. St. Boswell's, N.B.
Pomfret, Earl of...Easton Hall, Towcester
†Pomfret, Virgil...Tenterden, Kent
Ponsford, W. C...Trinity Chambers, Newcastle-on-T.
Poole, Domville...Marbury, Whitchurch, Shropshire
Pooly, Thomas...North Wold, Norfolk
Pope, Edward...Great Toller, Maiden Newton
Pope, John...Symondsbury, Bridport
Pope, J. Raymond...Shipridge Farm, Mitcheldean
Pope, Thomas...Harewood, Bletchingly, Surrey
Pope, William...Biggleswade
Porcher, Charles...Cliffe, Dorchester
Portal, M....Laverstoke House, Micheldever Station
Porter, James...Corney Bury, Buntingford
Porter, J. T. B....Lincoln
Porter, Maj.-Gen....Minterne House, Dorchester
Porter, Thos....Bawnton, Cirencester
Porter, Wm....Hembury Fort, Honiton
†Portman, Hon. W. H. B., M.P...Bryanston, Blandf.
†Portsmouth, Earl of...Eggesford Ho., North Devon
Postlethwaite, Thomas....Offley Hotes, Hitchin
Potter, Addison...Heaton Hall, Newcastle-on-Tyne
Potter, John...Basinghall Street, Leeds
Potter, T. B....Bush Hill, Manchester
Potts, B....Calverton, Nottingham
Potts, John...Gateshead
Potts, John D....Woodboro', Nottingham
Powell, Alfred...Avenue House, Worcester
Powell, Evan....Newtown, Montgom.
Powell, George...8, Beaufort Buildings, Strand, W.C.
Powell, John...Watton Mount, Brecon
Powell, John Thomas...Easton, Pewsey, Wilts
Powell, J. Folliot...7, Albion Place, Hyde Park, W.
Powell, Richard...Benson, Oxon
†Powell, Rev. S. H...Sharon Hall, Ripon
†Powell, Thos. H...Drinkstone Pk., Woolpit, Suffolk
†Powell, T., jun....Coldra, Newport, Monmouthsh.
Powell, Wm...Eglwgs Nunydd, Taibach, Glamorg.
Powell, Wm....Tickford Abbey, Newport Pagnell
†Power, K. Manley...Hill Court, Ross, Herefordshire
Powis, Benjamin...Newnham, Tenbury

†Powlett, Lord William...Downham Hall, Brandon
Powys-Lybbe, Philip L., M.P...Hardwick, Reading
†Poynder, T. H. A....Hartham Park, Corsham
Prance, Courtenay Connell...The Elms, Evesham
Pratt, Edward...Caldwell, Burton-on-Trent
Pratt, Rich. Fred....Gt. Sanders, Sedlescomb, Battle
Preece, John...Cressage, Salop
†Prentice, Manning...Stowmarket
Prescott, Williams...Clarence, Roehampton, S.W.
†Preston, Capt. J. N...FlasbyHl., Gargrave-in-Craven
Preston, Thomas...Scosthrop Ho., Bell-Busk, Leeds
†Pretyman, Arthur...Camp Hill, Nuneaton
Price, Charles...Quenington, Fairford
Price, James...Eye Cottage, Leominster
Price, Richard G., M.P....Norton Manor, Presteign
Price, Thomas...Quenington, Fairford
Price, William...Glan Twrch, Swansea Valley
Price, Wm. Philip...Tiberton Ct., Gloucester
Prichard, C. H....Westown Ho., Brislington, Bristol
Prickard, Thos....Dderw, Rhayader, Radnorshire
Priday, Samuel...Linton, Gloucester
Pride, William...Lanvihangel, Chepstow
Prideaux, Sir Edm. S., Bart....Netherton, Honiton
Priest, Alfred...Kingston-on-Thames, S.W.
Priestley, J....Hirdrefaig, Bangor, Isle of Anglesea
Priestley, S. O....Trefan, Pwllheli, Carnarvonshire
Princep, William...Newton, Tamworth
†Pritchard, John...Broseley, Salop
Pritchard, Robt....Llwydiarth Esgob, Bangor
Pritchard Wm...3, Albert St., Camden Road, N.W.
†Probyn, Edmund...Huntley, Gloucestershire
Proctor, M....Killingworth, Newcastle-on-Tyne
Proctor, Thomas...Elmdale House, Clifton, Bristol
†Prodgers, Herbert...Kington House, Chippenham
Pronger, James...Beeding, Horsham
Prosser, B...Offerton Farm, Hindlip, Worcester
Prosser, John...Holme Lacy, Hereford
†Prosser, Francis Wegg...Belmont, Hereford
Prosser, T....38, Cumberland Row, Newcastle-on-T.
Prout, John...Sawbridgeworth, Herts
Pryke, John P....Aldersfield Hall, Wickhambrook
Pryor, Morris...Baldock, Herts
Pryse, John Pugh...Bwlchbychan, Lampeter, S. W.
†Pryse, Capt., M.P....Gogerddan, Aberystwith
†Pryse, Pryse...Gogerddan, Bowskeet, Shrewsbury
Puckle, T. Broadhurst...Woodcote Grove, Carshalton
Pugh, David, M.P...Llanerchydol, Welshpool
Pugh, Robert...Llwyndû Lleyngwril, Dolgelly
†Pugh, William...Coal Port, Ironbridge, Salop
Puleston, Rev. T...Worthenbury Rectory, Wrexham
†Pulleine, James...Crakehall, Bedale
Pullen, William...Worcester
Pullin, James...Wraysbury, Staines
Pullin, Stephen...Mildridge Farm, Horton, Slough
Pulteney, J. G. B....Portslade House, Shoreham
†Punnett, P. Simpson...Chart Sutton, Staplehurst
Punchard, Charles...Blunt's Hall, Haverhill, Suffolk
Purrott, Charles...High Street, Croydon, S.
Pursell, Samuel...Oxley, Wolverhampton
Purser, Edward...116, Fenchurch Street, E.C.
Purton, Wm....The Woodhouse, Cleobury-Mortimer
Purves, Peter...The Grove, Brampton, Huntingdon
†Pusey, S. E. Bouverie...Pusey House, Faringdon

Pyatt, Abraham...Wilford, Nottingham
†Pye, Geo....Cublington, Madley, Herefordshire
†Pye, Henry Abington...Louth, Lincolnshire
Pye Moses...North Shields

Q.

Quartly, Jas....Molland House, South Molton
Quartly, John...Champson Molland, South Molton
Quibell, William Oliver...Newark-on-Trent
Quinn, P....Agency, Poyntz Pass, Ireland

R.

Racster, William...Withington Court, Hereford
Radcliffe, Rev. Walter...Warleigh, Plymouth
Radford, H. B....Stanton Ho., Burton-on-Trent
Radford, William...Beeston, Nottingham
Raglan, Lord...Cefntilla Ho., Usk, Monmouthshire
Railton, Henry...Snittlegarth, Wigton
†Raincock, H. D....Croydon
Raine, William Surtees...Gainford, Darlington
Rainforth, Edward...Monkhopton, Bridgnorth
Ralph, R. W....Honnington Grange, Newport, Salop
Ralphs, John...Saighton, Chester
Ralston, James...Danesfield, Great Marlow
Ralston, Wm. Henry...Keele, Newcastle, Staffs.
Rammell, Thomas...Sturry Court, Canterbury
Ramsay, David R....Willington, Wallsend
Ramsay, G. H....Derwent Villa, Newcastle-on-T.
Ramsay, John T...Walbottle Hall, Newcastle-on-T.
Ramsay, Thomas...Sherburn Green, Gateshead
Ramsbotham, J...Crowborough Warren, Tunb. Wells
†Ramsden, John Charles...Oxen Hall, Tadcaster
Ramsden, Robert...Carlton Hall, Worksop
Ramsey, John...9, Endsleigh Street, W.C.
Rand, William...Saffron Walden
Randall, Alexander...Maidstone
Randall, R. G....Winfrith, Dorchester, Dorset
Randell, Charles...Chadbury, Evesham
Randell, James R....Chadbury, Evesham
Randle, Thomas...Ombersley, Droitwich
Randolph, Vice-Ad. C. G....Gt. Comp, Sevenoaks
Randolph, Lt.-Col. C. W....5, Victoria Sq., S. W.
Ranford, Chas...377, New Cross Road, S.E.
Ranger, Josiah...Ashdown Park, East Grinstead
Ranken, W. B....Abbott's Langley House, Herts
Rankin, John...Union Foundry, Liverpool
Ransome, Frederick...Ipswich
Ransome, James Allen...Ipswich
Ransome, J. E....Bolton Hill, Ipswich
Ransome, R. C....Bolton Hill, Ipswich
Ransome, Robert...Ipswich
Ratcliff, R... Standard Hill, Ninfield, Battle
Ratleff, William...Newmarket
Ravensworth, Ld....Ravensworth Castle, Gateshead
Rawes, John...Springwood Cottage, Chorley
Rawlence, James...Bulbridge, Wilton, Salisbury
Rawlinson, Robt...Graythwaite, Newton-in-Cartmel
Rawson, Richard...Wheat Hill, Roby, Prescot
†Ray, Samuel...St. Paul's, Belchamp, Halstead
Rayer, John...Eastington, Northleach
Rayer, Wm. Carew...Tidcombe, Tiverton
†Raynbird, Hugh...Church Street, Basingstoke
Raynbird, Robert...Hengrave, Bury St. Edmund's
Rayne, Septimus William...Newcastle-on-Tyne
Rayner, Henry...Ely
Rea, Charles...Doddington, Wooler, Northumb.
†Read, Clare Sewell...Plumstead, Norwich
†Read, Geo., jun....Baxton Hall, Brandon, Norfolk
Read, Henry...London Road, Beccles
Read, James Marsh...Elkstone, Cheltenham
Reay, Matthew...Heworth, Gateshead
Reay, Robert...Berwick Hill, Newcastle-on-Tyne
Reading, William...Ashorne, Leamington
Redmayne, J. M....Saltwell, Gateshead
Reed, Mary...Seghill, Newcastle-on-Tyne
Rees, W. Treharne...Holly House, Newport, Mon.
Reeve, Major-Gen....Leadenham, Grantham
Reeves, J. R....Hantsland, Crawley Down, Sussex
Reeves, Robert...Bratton, Westbury
Reid, Andrew...Newcastle-on-Tyne
Reid, David...41, Grey Street, Newcastle-on-Tyne
Reid, Edward...29, Sandhill, Newcastle-on-Tyne
Reid, Sir John Rae, Bart....The Grove, Ewell
Relph, G. R. Greenhow...Beech Hill, Usk
Rendle, William Edgcumbe...68, Welbeck St., W.
Rennoldson, J. P...Jesmond Vale Ho., Newc.-on-T.
Reynardson, Henry Birch...Adwell, Tetsworth
Reynolds, Joseph Benj....Lubbesthorpe, Leicester
†Reynolds, Dr. William...Coed-dû, Mold
Rhodes, J. Armitage...Roundhay, Leeds
Rhodes, James...Seal Lodge, Farnham, Surrey
†Ricards, Mortimer...Bure Homage, Christchurch
Rice, Edward Royd...Dane Court, Wingham
Rich, Stiles...Didmarton, Chippenham
†Richards, Edward Priest...Cardiff
†Richards, John...Llyncleys, Oswestry
†Richardson, E., jun...Chem. ManureWks., Blaydon
Richardson, G....Bridlington Quay, Yorkshire
Richardson, Henry...Cherry Hill, York
Richardson, James...104, Percy St., Newcastle-on-T.
Richardson, Jasper...Victoria Ter., Newcastle-on-T.
Richardson, J...Northlands House, Winterton, Brigg
Richardson, John...Alnwick
Richardson, John...Asgarby, Spilsby
Richardson, J. B....Shotley Park, Gateshead
Richardson, J. M...14, VictoriaTer., Newcastle-on-T.
Richardson, Sir J. S., Bt....Pitfour Castle, Perth, N.B.
Richardson, J. W....Willoughton, Kirton-in-Lindsay
Richardson, Jonathan..Glenmore, Lisburn, Antrim
Richardson, Richard...Halewood, Prescot, Lanc.
†Richardson, Robt...Rainford, St. Helen's, Lanc.
Richardson, Capt. Thos....Sutton Hurst, Barcombe
Richardson, T., M.D...17, FramlingtonPl., Newc.-on-T
Richardson, T. M....Hibaldstow Grange, Kirton
†Richmond, Duke of...Goodwood, Chichester
Richmond, Francis...Salford, Manchester
Richmond, William...62, South John St., Liverpool
Rickard, Martyn William...Devonport
Riddell, E....Cheeseburn Grange, Newcastle-on-Ty.
†Riddell, Henry Buchanan..The Palace, Maidstone

Riddell, John...Bewick Folly, Alnwick
Riddell, T....The Park, Felton, Northumberland
†Riddell, Sir W. B., Bt...Hepple Rothbury,Morpeth
Rider, Joseph...Leeds
Ridge, T. J....Hambledon, Horndean, Hampshire
Ridgway, Capt. Alex....Blackanton, Totnes
Ridgway, John...Fairlawn, Wrotham, Kent
†Ridgway, J....Cauldon Pl., Shelton, Stoke-on-Trent
Ridgway, Thomas...Lymm, Warrington
†Ridler, Richard H....Gatterlop, Leominster
Ridley, Andrew...Newcastle-on-Tyne
Ridley, J....Park End, Hexham
Ridley, J. M....Walwick Hall, Hexham
Ridley, T. D....Chelmsford
Rigby, Thomas...Finney Wood, Winsford, Cheshire
Rigden, Richard Henry...Salisbury
Rigden, William...Hove Farm, Brighton
Rigg, Joseph...Filloughby, Coventry
Riley, Edmund...South Dalton, Beverley
†Riley, Luke...Meriden, Coventry
Riley, W. F....Forest Hill, Windsor
Rimell, R., jun....Tedney, Whitbourne, Worcester
Rimell, Wm...Berrington Court, Campden, Glouces.
Ringer, John...West Harling, East Harling, Norfolk
Rising, Robert...Horsey, Great Yarmouth
Rising, Wm....Somerton Hall, Great Yarmouth
Risley, Rev. W. C....Deddington, Banbury
Rist, Isaac...Tattingstone, Ipswich
†River, John...
Rivers, Lord...Rushmore Lodge, Ludwell, Salisbury
Rix, Benjamin...St. Matthew's, Ipswich
Rix, John, sen....Lusley Court, Worcester
Rix, Nathaniel, jun....London Colney, St. Alban's
Roads, J....Ashmore Farm, Addington, Winslow
†Robarts, A. J....Lillingstone Dayrell, Bucks
Roberts, Bennett S....10, Abbey Square, Chester
Roberts, Charles G....R. A. College, Cirencester
Roberts, Edw....Almshoe Bury, Hitchin
Roberts, Hugh...Eastgate Row, Chester
Roberts, Joseph...Southleigh, Truro
Roberts, Richard...Burrington, Ludlow
Roberts, Thomas Lloyd...Corfton Hall, Bromfield
Roberts, Thomas...Ivington Bury, Leominster
Roberts, Wm. Harvey...Trewhiddle, St. Austell
†Roberts, Wightwick...Trethill, Sheviock
Robertson, John, J. E....Naish Farm, Christchurch
Robey, Robert...Canwick Road, Lincoln
Robinson, D....Clitheroe Castle, Clitheroe
Robinson, George...Whiston, Shiffnal
Robinson, G...Slimbridge, Stonehouse, Gloucesters.
Robinson, Isaac...Iron Foundry, Halesworth
Robinson, Jas....Huggart's Farm, Brindle, Chorley
Robinson, John...Mark Lane, Leeds
Robinson, John...Wootton Lodge, Gloucester
Robinson, J...Roseforth Cott., Gosforth, Newc.-on-T.
Robinson, Col. John George...21, Montagu Sq., W.
Robinson, John Rudly...Hutton Rudly, York
Robinson, John G....Oakley Hl., Bishop's Stortford
Robinson, Sir J. S., Bt...Rokeby Hall, Louth, Ireland
†Robinson, Jos....Clifton Pastures, Newport Pagnel
Robinson, Richard...Utkinton, Tarporley
Robinson, Rowland...Fenny Drayton, Nuneaton
Robinson, Thomas...Nuthill, Hedon, Yorkshire
Robinson, Thomas...Castle Ashby, Northampton
Robinson, William...Bone Hill, Tamworth
Robinson, William...Heatley Lymm, Cheshire
Robotham, A...Oak Farm, Drayton Bass., Tamworth
Robson, Daniel...Saltwell, Gateshead, Durham
Robson, James...Brackenborough, Louth
Robson, John...Fawdon House, Newcastle-on-Tyne
Robson, John...3, Forth Street, Newcastle-on-Tyne
Robson, John...Sunniside, Newcastle-on-Tyne
†Robson, John...Byness, Rochester, Northumb.
Robson, Ralph...Hexham
Robson, William...Wilton, Salisbury
Robson, Wm....2, Leazes Terrace, Newcastle-on-T.
†Roch, Nicholas...Paskiston, Pembroke
Rocke, James John...Glastonbury
†Rodd, F....Trebartha Hall, Launceston
Roddam, J. J....Newtown, Stanhope, Darlington
Roddam, Wm...Roddam, Wooller, Northumberland
Rodgett, Miles...West Cliffe, Preston Lancashire
Rodwell, William...Woodlands, Holbrook
†Roebuck, J. A., M.P....19, Ashley Place, S.W.
Rogers, Henry...Stagenhoe Park, Welwyn
†Rogers, John J....Penrose, Helston
†Rolfe, C. Fawcett Neville...Sedgeford Hall, Lynn
Rolls, John E. W....The Hendre, Monmouth
Rolt, John...Ozleworth Park, Gloucester
Romilly, Edward...Porthkerry, Cardiff
Romney, Earl of...The Mote, Maidstone
Ronaldson, J. T...Low Elswick, Newcastle-on-Tyne
†Rooper, George...Nascott House, Watford
†Rooper, J. B....Abbotts Ripton, Hunts
Root, William...Chipping Warden, Banbury
†Roper, R. S. D. R....Sedbury Pk., Richmond, Yks.
Roper, William...Ling, Lebergham, Cumberland
Rose, Christopher...Zeals Green, Mere, Wiltshire
Rose, Philip...Rayners, High Wycombe, Bucks
Rosewarne, John...Nanpuska, Hayle, Cornwall
†Ross, James...Hoo Park Farm, Luton
†Rothwell, R. R....Sharples Hall, Bolton, Lancashire
Rotton, Richard...3, Boltons, Brompton, S.W.
Round, Chas. Grey...Birch Hall, Colchester
Rous, Col. G....
Rous, Hon. Wm. Rufus...Worstead House, Norwich
†Rouse-Boughton, Sir C. H., Bt...Downton Hall, Ludl.
Row, E. T....Moulds Haugh, Acklington
Row, Wm. North...Cove, Tiverton
Rowe, Samuel...Nursted House, Petersfield
Rowe, W. Wevill...Gt. Hay, Tamerton, Tavistock
Rowell, H...Coally Hill, Walbottle, Newcastle-on-T.
Rowland, Edward...Claygate House, Esher
Rowland, John...Hollybank, Woodstock
†Rowland, R....Creslow, Aylesbury
Rowlandson, Charles...The College, Durham
†Rowlandson, Samuel...The College, Durham
Rowlandson, Samuel...Newton Morrell, Darlington
Rowley, George W....St. Neot's
Rowley, Hon. R. T...Rhyderddwyn Faur, Rhuddlan
Rowley, John Geo....Rockstowes House, Dursley
Rowley, John Jephson...Rowthorne, Chesterfield
Roxby, W. Wright...Lovaine Ter., Newcastle-on-T.
†Royds, Albert Hudson...Falinge, Rochdale
†Royds, Henry...Elm House, Wavertree, Liverp.
†Royds, Rev. John...Heysham Rectory, Lancaster

†**Royston, Viscount**...Wimpole, Cambridgeshire
Ruck, Edmund...Castle Hill, Cricklade
Ruck, Lawrence...9, Staple Inn, W.C.
Rudyerd, Henry...Iver, Uxbridge
Rumball, H...The Hollies, Four Oaks, Sutton Colef.
Rumbold, C. J. A....5, Percival Terrace, Brighton
Rase, Robertson...Warfield, Bracknell, Berks
†**Russell, Lord C. J. F.**...Drakeloe Lodge, Woburn
Russell, Sir Chas., Bt....Swallowfield, Reading
Russell, David...Clifton Lodge, York
Russell, James...Brimstage, Birkenhead
Russell, John...Risca House, Newport, Mon.
†**Russell, Robert**...Pilmuir, Leven, Fife
Russell, Robert...Farningham, Dartford
†**Russell, Sir W., Bt., M P.**..Charlton Pk., Cheltenham
Rust, James...Alconbury, Huntingdon
Rust, Wm. Holyoake...Good Easter, Chelmsford
Ruston, A. S....Aylesby Ho., Chatteris, Isle of Ely
Ruston, Joseph...Lincoln
Rutson, Wm....Newby Wisk, Northallerton
Rutzen, Baron F. de..Slebeck Hall, Haverfordwest
†**Ryder, Hon. G. D.**...Westbrook, Hemel Hempsted
Ryder, T. B....57A, Church Street, Liverpool
Ryland, T....Gt. Lister Street Works, Birmingham
Ryland, W. Hawkes...Bewdley, Worcester
Rylatt, W....Branswell, Sleaford

S.

Sabin, John...Harbury, Southam, Warwickshire
Sadler, Henry...Mid-Lavant, Chichester
Sadler, R. S....The Valley Ho., Langham, Colches.
Sadler, T. W....Norton Mains, Ratho, Edinburgh
Sadler, Thomas...Chiddingfold, Surrey
Sadler, William...Chiddingfold, Surrey
Sadler, Wm....Ferry Gate, Dirleton, Haddingtonsh.
Sadler, William James...Calcutt, Cricklade
Sainsbury, W....Hunts Ho., W. Lavington, Devizes
†**St. Alban's, Duke of**...Redbourne Hall, Brigg
†**St. Leger, Major John**...Park Hill, Rotherham
†**St. Maur, Lord Archibald**...Burton, Loughborough
Sallit, Matthew...Saxlingham, Norwich
†**Salkeld, Thomas**...Holme Hill, Carlisle
Salomons, David...Broom Hill, Tonbridge
Salt Herbert...Methley Park, Leeds
Salt, Thomas...Weeping Cross, Stafford
Salt, Titus...Methley Park, Leeds
Salter, W. P., jun....The Abbey, Thetford
Saltmarshe, Philip...Saltmarshe, Howden
Salusbury, Rev. Thelwall J. T....Offley, Hitchin
†**Salvin, M. C.**..Sarnsfield Court, Kington, Hereford
Samman, Wm....Middleton Park, Bicester
Samman, John...Broadwell, Moreton-in-the-Marsh
Sample, Thomas...Bothal Castle, Morpeth
Sampson, H. Atkins...Rowney Abbey, Ware
Sampson, Thomas...Moor Hall, Ninfield, Battle
Samuelson. B....Britannia Iron Works, Banbury
Sanday, W....Holme-Pierrepont, Nottinghamshire
†**Sandbach, H. R.** ..Hafodunos, Llanrwst, Denbighs.
Sanders, E. A....Stoke House, Exeter
Sanderson, Hastings...5, Binswood E., Leamington
Sanderson, Jas...15, Manchester Bdgs., Westmin., S.W.
Sanderson, R. B., jun...N. Jesmond, Newc.-on-Tyne
†**Sandford, Mark**...Martin, Dover
Sandle, Wm....52, Upper Brunswick Pl., Brighton
Sandwich, Earl of...Hinchingbrooke House, Hunts
†**Satterfield, Joshua**...Alderley Edge, Manchester
Saunders, James...St. Paul's, Clapham, S.
Saunders, Randle Wm....Nunwick Hall, Penrith
†**Saunders, Thos. B.**...Priory, Bradford-on-Avon
Saunders, T. H....Watercombe, Dorchester, Dorset
†**Saunders, William Wilson**...Hillfield, Reigate
Savage, S. Powell..Leys Farm, Wootton-under-Edge
Savery, A. B....Hardwick Lodge, Chepstow
Savidge, Mat....The Lodge Farm, Chipping Norton
Savill, John...Orange Hall, Gosfield, Halstead
Savory, James...Tewkesbury
Savory, Paul Haines...Gloucester
†**Savignon, Don D.**...Mexico
Sawyer, Charles...Heywood Lodge, Maidenhead
Saxby, Thomas...West Firle, Lewes
Saxelby, Thos....Urecote Hall, Hampton-in-Arden
Say, R. Hall...Oakley Court, Windsor
Sayers, John...Field Dalling, Holt, Thetford
Scarborough, John L....Colyford, Axminster
Scarsdale, Lord...Kedleston Hall, Derby
Scarth, Jonathan...Shrewsbury
Scarth, Thos. Freshfield...Keverstone, Darlington
Scarth, William Thomas...Keverstone, Darlington
Scawin, Thomas...Durham
Schmaltz, Gustavus...Ryton, Newcastle-on-Tyne
Schneider, Henry W....Lightburne Ho., Ulverston
Schollick, E. Jones...Aldingham Hall, Ulverston
†**Schwann, F. S.**...N. Houghton Manor, Stockbridge
Scoones, H. B....
Scott, Col. Hon. C. Grantham...79, Eaton Sq., S.W
Scott, Jas. Winter...Rotherfield Park, Alton, Hants
Scott, J....Green Head, Milnthorpe, Westmoreland
Scott, John David...Park Road, Newcastle-on-Tyne
Scott, John Fife...Eldon Street, Newcastle-on-Tyne
Scott, Joseph...Carlton Place, Newcastle-on-Tyne
Scott, Joseph...Colney Hall, Norwich
Scott, Thomas...Broomhouse, Beal, Northumberland
Scott, Thomas... 18, Parliament Street, S.W.
Scott, Thomas Edward...Crondall, Farnham, Surrey
Scott, William... Empshot Grange, Petersfield
Scott, Wm. C.... Thorpe, Chertsey
Scott, William Henry...Tynemouth
Scragg, Thomas...Calveley, Tarporley
†**Scragg, William**... Great Clacton, Colchester
†**Scratton, D. R.**...Prittlewell Priory, Rochford
†**Scriven, E.**...Wormleighton Ho., Southam, Warwk
Scriven, George...Castle Ashby, Northampton
Scudamore, John...Pengeley Court, Ross
Scudamore, Lt.-Col....Kentchurch Court, Hereford
Seager, James Lys...Carroun Ho., S. Lambeth, S.
Seal, Charles Wm....Leighdelamere, Chippenham
Seaman, Joseph...Worcester
Seamark, Richard...Mount St. Alban's, Caerleon
Searson, R....Cranmore Lodge, Market Deeping
Seawell, Thos. Aug....Marelands, Farnham, Surrey
†**Sedgwick, Professor**...Trinity College, Cambridge
Seels, Henry John...Wainfleet Hall, Lincolnshire
Selmes, James...Tufton Pl., Northiam, Staplehurst

Senhouse, Capt. Wm....Ashby St. Ledgers, Rugby
Seppings, T. Johnson...South Creake, Fakenham
†Severn, J. P...Penybont Hall, Penybont, Radnorsh.
Seward, Samuel...Weston, Petersfield
Sewell, Daniel...Beaumont Hall, Colchester
Sewell, Rev. Thos....The Cottage, Bolney, Cuckfield
Sexton, George...Wherstead, Ipswich
†Sexton, G. Mumford...Wherstead Hall, Ipswich
Seymour, H. D., M.P...Knoyle House, Hindon, Wilts
Seymour, Capt. Henry...Park Place, Old Windsor
†Seymour, Rev. Sir J. H. C....Berkhampstead
Shackel, George...Earley Court, Reading
Shackle, Thomas...Hayes, Uxbridge
Shackleton, John...Scarcroft, Leeds
Shaftesbury, Earl of...St. Giles', Cranbourne
Shafto, R. D., M.P....Hampworth Lodge, Salisbury
Shafto, T. D....CheveneyHouse, Hunton, Maidstone
Shann, Charles...Inholes, Tadcaster
Sharman, S....Home Farm, Little Crosby, Liverpl.
Sharp Granville...Dean Scales, Cockermouth
Sharp, Henry Morton..Monks Hardwicke, St. Neot's
Sharp, Isaac...Dairyknoll, Middlesborough-on-Tees
Sharp, William...Shottesbrook, Maidenhead
Sharpe, Robert...Hewelsfield Court, Chepstow
Sharpe, William...Mavis Enderby, Spilsby
Sharpe, W. Barling..Baker's Cross, Cranbrook, Kent
Shaw, Alex. Nesbitt...Newhall, Fortrose, Rosshire
Shaw, Chas. H...Woodbine Cottage, Hackney, N.E.
Shaw, F. G...Seaham Lodge, Seaham Harbr., Durhm.
Shaw, H. Geo....The Hollies, Wilmslow, Cheshire
†Shaw, John...Beddington Lodge, Croydon, S.
Shaw, John...New Wortley, Leeds
Shaw, John...Huntsbury Hill, Northampton
Shaw, William...Cold Norton, Stone, Staffordshire
Shaw, William...Far Coton, Northampton
†Shawe, R. F....Brantingham Hall, Hull
Shearer, B. P....Swanmore House, Bishop's Waltham
Sheffield, Earl of...Sheffield Park, Uckfield
Sheffield, Sir R., Bt....Normanby Park, Brigg
†Sheild, W. H....Lampeter Valley, Narberth
†Sheldon, H. J....Brailes House, Shipston-on-Stour
†Sheldon, John...Western Hill, Durham
†Sheldon, Jonathan...Eynsham, Oxford
Sheldrake, E....Ixworth, Thorpe, Bury St. Edmund's
Shellabear, Samuel...Holkham, Wells, Norfolk
Shepheard, Joseph...Torpoint, Cornwall
Shepherd, Edw....Bovington Farm, Wool, Wareham
Sheppard, J. G....Ashe High Ho., Wickham Market
†Sherard, Lord...Glatton, Stilton, Hunts
Sherborn, Francis...Bedfont, Hounslow, W.
†Sherborn, Francis, jun....Bedfont, Hounslow, W.
Sherbrooke, H. Porter...Oxton, Southwell, Notts
Sheridan, R. B., M.P....Frampton Court, Dorchester
Sheriff, Alex. C....Worcester
Shield, James, jun....Ancroft, Beal
Shield, John...66, Grey Street, Newcastle-on-Tyne
Shiell, John...Kenton, Newcastle-on-Tyne
†Shillingford, George Wm....Eynsham, Oxford
Shingler, Hugh...Hopesay, Aston-on-Clune, Salop
Shingler, J. H....Birch Hall, Ellesmere
Shipman, Thomas...Croxton Lodge, Grantham
Shipperdon, Rev. E. H....Hermitage, Chester-le-St.
Shipway, Wm....Hanley Castle, Upton-on-Severn
Shirley, Thomas...Newport, Bishop's Stortford
Shittler, Wm. Rowden...Bishopstone, Salisbury
Shorthose, J....Shield Field Green, Newc.-on-Tyne
†Shuter, James...Crookham, Newbury
†Shuttleworth, Joseph...Hartsholme Hall, Lincoln
Sibley, Robert...Annable's Farm, Luton
Sidney, P. Joseph Malow...Cowpen Ho., Northum.
Sidney, S...St. Alban's Cot., Northend, Fulham, S.W.
Sikes, John...Sudbury, Suffolk
Sill, Rev. J. P....Witheringsett Rectory, Stonham
†Sills, William...Casthorpe, Grantham
†Sillifant, John...Coombe, Copplestone, Devon
Silvester, Francis R....St. Alban's
Simcoe, Rev. H. A....Penheale, Launceston
Simeon, Sir J., Bart....Swainston, Isle of Wight
Simmons, Thos....East Peckham, Tonbridge, Kent
Simon, James...Greenfield, Holywell, Flintshire
†Simonds, J. Cabourne...Fishtoft, Boston
†Simonds, Thomas...Roundhay Grange, Leeds
Simonds, W. Barrow...Abbott's Barton, Winchester
Simpkin, Benjamin...Hoby, Leicestershire
Simpson, Alex....Teawig, Beanly, Invernesshire
Simpson, Alexander...Hull
Simpson, Benjamin Soulby...Boston
Simpson, E. Thornhill...Walton, Wakefield
Simpson, H. Bridgman...Babworth, Retford, Notts
Simpson, John...Pyle Hotel, Bridgend
Simpson, John...East Barnet, N.
Simpson, John...Potterspury, Stony Stratford
Simpson, Joseph...Spofforth Park, Weatherby
†Simpson, Pinder...29, Saville Row, W.
Simpson, Rich....The Cliffe, Douglas, Isle of Man
Simpson, S. M...Kingham Hill, Chipping Norton
Simpson, S. W....North Laiths, Rufford, Ollerton
Simpson, Thos....High Street, Lincoln
Sims, W. Dyllwyn...Ipswich
Sinclair, John...Glenurquhach, Inverness
†Sisson, Robert James...Talardy, St. Asaph
Sitwell, Rev. H. W....Stainsby House, Derby
Sitwell, Robert Sacheverill...Merley, Derby
Skelton, W...Sutton Bridge, Long Sutton, Lincolnsh.
Skillicorne, W. Nash...Cheltenham
Skipworth, G. B....Moortown House, Caistor
Skipworth, W....South Kelsey, Brigg
Skirving, William...15, Queen Square, Liverpool
†Slade, A. F....Kemmal House, Chiselhurst
†Sladen, Charles...Geelong, Victoria, Australia
Sladen, Douglas B....2, King's Arms Yard, E.C.
Sladen, Joseph...Hartsbourne Manor, Bushey Heath
Sladen, St. Barbe...14, Parliament Street, S.W.
Slater, Cyrus...Dunkirk, Holmes Chapel
Slater, Martin...Weston Colville, Newmarket
Slator, Thomas...Market Place, Boston
Slatter, William...Stratton, Cirencester
Sleigh, Holmes...Ellerton Grange, Newport, Salop
Slye, Wm. Walter...Beaumont Castle, Lancaster
Smallbones, G. B....Sternickel & Lintenis, Vienna
Smallpiece, Job...Compton, Guildford
Smart, G....Woodhouse Grange, Aberford, Milford
Smart, Major George John...Tumby, Boston
Smart, William Lynn...Linden, Woburn
Smedley, C. E. B....Shottle House, Belper
Smijth, Sir William Bowyer, Bt....Hill Hall, Epping

†**Smith,** Abel...Woodhall Park, Hertford
Smith, Alexander M....Kent Street, Liverpool
Smith, Apsley...10, Hungershall Park, Tunbridge
†**Smith,** Augustus...1, Eaton Square, S.W.
Smith, Charles...Kent Street, Liverpool
Smith, Charles Edward...
†**Smith,** Sir Chas. C. W., Bt....Suttons, Romford, E.
†**Smith,** C. R....Filkin's Hall, Lechlade
Smith, D., jun....Martley Hall, Wickham Market
†**Smith,** Edw....Ratcliffe-on-Trent
†**Smith,** Edward James...14, Whitehall Place, S.W.
Smith, Felix...Upton Bishop, Ross
†**Smith,** George...The Luham, Penrith
Smith, Graham...Easton Grey, Malmesbury
Smith, Geo. Robt....Selsdon Park, Croydon, S.
Smith, Henry Abel...Welford, Nottingham
Smith, Henry...Cropwell, Bingham, Notts
Smith, Henry...Eshe Hall, Durham
Smith, Henry John...Emsworth
Smith, Hen...New House, Sutton Maddock, Shiffnal
Smith, Henry...Brierly Hill
Smith, Henry Trefusis...Devonport
Smith, Hugh...
Smith, James...Little Moyle, Carlow, Ireland
Smith, James...Stanstead, Chichester
Smith, J. A....Bradford Peverell, Dorchester
†**Smith,** J. Hesletine..10, Highbury Pl., Islington, N.
†**Smith,** J. Metcalf...Leeds
†**Smith,** John...
Smith, John...Althrey, Wrexham
Smith, John...Breeder Hills, Grantham
Smith, John...Fradswell Hall, Stone, Staffordshire
Smith, John...Crownthorpe, Wymondham
Smith, John...Marton Lodge, Bridlington
Smith, John...Sevenhampton, Andoversford
Smith, John...The Hundred, Romsey
†**Smith,** Sir John J., Bt....Down House, Blandford
Smith, John P....Hereford
Smith, John Philip...Lower Wick, Worcester
Smith, Rev. John Tetley...Repton, Burton-on-Trent
Smith, John T....Thornby Grange, Guilsborough
Smith, Joseph...Henley-in-Arden
Smith, Joseph Lambourne...Ledbury
Smith, Martin T., M.P...13, Upper Belgrave St., S.W.
Smith, M. P...
Smith, Richard...Tunbridge Wells
Smith, Richard Booth..Huxley Farm, Edmonton, N.
Smith, Robert...Heath Farm, St. Alban's
†**Smith,** Robert...Goldings, Hertford
Smith, Robert...Emmett's Grange, South Molton
Smith, Robert Thursfield...Whitchurch, Salop
Smith, Rev. S....Lois Weedon Vicarage, Towcester
Smith, Thomas...Little Mollington, Chester
Smith, T. Fenton...Usworth, Gateshead
Smith, Thomas Robert...Shareshill, Wolverhampton
Smith, Tysoe...Hinchwick Farm, Stow-on-the-Wold
†**Smith,** Sir Wm., Bt....Eardiston House, Worcester
Smith, William...Chimhams, Farningham, Dartford
Smith, William W....Colwood Park, Cuckfield
†**Smith,** William...Winchcomb, Gloucestershire
†**Smith,** William...Bibury, Fairford
Smith, William...Gathorpe, Goole, Yorkshire
Smith, William...Kettering
Smith, William...Littlehales, Newport, Shropshire
Smith, William Arthur...Colebrook Park, Tunbridge
†**Smith,** W. B....Stoneleigh Villa, Leamington
Smith, William J....Monkland, Leominster
Smith, William Robert...Rushford, Evesham
Smithers, William...Sondes Place Farm, Dorking
Smithin, Benjamin...Sheriff's Leuch, Evesham
Smithin, Joseph...Wadborough, Kempsey
Smithson, Geo....101, Bristol Road, Birmingham
Smyth, James...Peasenhall, Witham
†**Smyth,** John George...Heath Hall, Wakefield
Smyth, William...Little Houghton, Northampton
Smyth, Rev. William...Elkington Hall, Louth
Smythe, Sir C. F., Bt....Acton Burnell, Shrewsbury
†**Smythies,** Carleton...Norton Rectory, Faversham
†**Smythies,** George...Leintwardine, Salop
Sneezum, Thomas...
†**Snell,** John F....Great Bardfield Lodge, Braintree
Snewing, Charles...Holywell Farm, Watford
Snow, Cyprian...Dunston, Sleaford
Snow, Rev. George D'Oyley...Pimperne, Blandford
Snow, James M....Metheringham, Sleaford
Snowball, William...Monkton, Gateshead
Snowden, William...Longford, Gloucester
Soames, D. W....Harrow Weald, Stanmore, N.W.
Solley, George Bushell...Monkton Court, Ramsgate
Somerset, John...Milton, Pewsey, Wilts
†**Somerville,** J. C....Dinder Ho., Wells, Somersetsh.
Souley, W....Kirby Moorside, Yorkshire
†**Southall,** Thomas, Worcester
Sowerby, Francis...Aylesby, Great Grimsby
Sowerby, John...Shipcote, Gateshead
Spain, George...Hackling, Sandwich
Spanton, Robert...Little Thorns Farm, Swaffham
Spark, William...Shilton House, Coventry
†**Sparks,** William...Crewkerne
Speakman, Thomas...Doddington Park, Nantwich
Spearing, J. B....Portland Lodge, Park Town, Oxf.
Spearing, William...Kennett, Marlborough
Spence, John F....Chirton Cottage, North Shields
Spencer, Earl...Althorp, Northampton
Spencer, Capt....Kirby Stephen, Westmoreland
†**Spencer,** E....Bircher, Leominster
Spencer, Francis...Claybrooke, Lutterworth
Spencer, James, jun....Newcastle-on-Tyne
Spencer, John...Corn Market, Doncaster
Spencer, John...12, Catherine Terrace, Gateshead
Spencer, John, jun...Whorlton Hall, Newc.-on-Tyne
Spencer, J. W., jun....Whorlton Hall, Newc.-on-T.
†**Spencer,** M....Millfield, Newburn, Blaydon-on-T.
Spencer, Samuel...Snarestone, Ashby-de-la-Zouch
Spencer, Thos..The Grove, Ryton, Blaydon-on-Tyne
Spencer, William...Team Villa, Gateshead
†**Spicer,** J. W. Gooch...35, Belgrave Square, S.W.
Spill, George...Hackney Wick, N.E.
Spinks, Abraham...West Bilney, Lynn
Splatt, William Francis...Abbotsford, Torquay
Spooner, Prof. C....Roy. Veter. College, N.W.
Spooner, Thomas...Burton-upon-Trent
Spooner, Richard, M.P....Birmingham
Spooner, William Charles...Southampton
Spragge, Francis Hoare...Octon House, Torquay
Spraggon, Benjamin...Nafferton, Stocksfield

Squarey, Elias P....Odstock, Salisbury
Squire, Edward Frederick...Cross Hall, St. Neot's
Squire, William...5, Coleman Street, E.C.
Stable, Charles Leonard...Crayford, S.E.
Stable, Robert Scott...The Park, Wanstead, N.E.
†Stables, W. A....Cawdor Castle, Nairnshire, N.B.
Stafford, Robert...31, Hyde Park Square, W.
Stafford, Thomas...Marnham, Nottingham
Stainton, John...Dalby, Spilsby
Stallard, John...Worcester
Stallard, Josiah...Worcester
Stallard, William...Brockhampton, Ross
Stamford & Warrington, Earl of..Enville Ho., Stour.
Standing, Thomas...Fishergate, Preston
†Standish, W. Standish...Duxbury Park, Chorley
Stane, John Bramston...Forest Hall, Ongar
Stanford, Walter...Parham, Storrington, Sussex
Stanford, W., jun....Steyning Court Farm, Steyning
†Stanhope, J. B., M.P....Revesby Abbey, Boston
Stanier, J. E....Seaton, Wellington, Salop
†Staniforth, Rev. Thos....Storr's Hall, Windermere
Stanley, Edward...14, Grosvenor Square, W.
Stanley, E....The Height, Newton-in-Cartmel
†Stanley, Lord, M.P....Knowsley, Prescot
Stanley, Henry...Upton, Shiffnal
Stanley, W. H. S., jun....21, Curzon St., May Fair, W.
Stansfield, W. R. C....Esholt Hall, Leeds
Stanton, Henry...79, Coleman Street, E.C.
Stark, Michael J....Duke's Palace Bridge, Norwich
Starkey, Major L. C....Wrenbury Hall, Nantwich
†Starkey, J. Bayntun...Spye Park, Chippenham
Starmer, Chas....Handleby, Spilsby
Statham, Rev. R. J....Rectory, Tarporley
Statter, Thomas...Knowsley Hall, Bury, Lancashire
Stawell, Col. Alcock...Kilbrittain, Bandon, Cork
Stead, Titus Bennett...Leeds
Stearn, Samuel G....Brandestone, Wickham Market
Stebbing, Henry...Stow Bedon Hall, Attleboro'
†Stedman, James...Lucton, Leominster
Stedman, Robert...Pakenham, Bury St. Edmund's
Stedman, Wm....Bedstone Hall, Aston, Shrewsbury
Steedman, George...Hall Green, Birmingham
Steedman, Joseph...Meriden, Coventry
Stenning, Edward...Stratton House, Godstone
Stenning, William...Halsford, East Grinstead
Stenton, Henry Cawdron...Southwell
Stephens, Charles...Earley Court, Reading
Stephens, E....Trewornan, Wadebridge, Cornwall
Stephens, Rev. Ferd. T....St. Mawgan, Cornwall
Stephens, George...Cropthorne, Pershore
Stephens, H. L....Tregenna Castle, Hayle, Cornwall
Stephens, J....23, Eastbourne Terr., Hyde Park, W.
†Stephens, Robert...Ive's Place, Maidenhead
Stephens, S. H....Offoxey, Tong, Shiffnal
Stephens, S. J...5, Charlotte Street, Portland Pl., W.
Stephenson, Clement...Newcastle-on-Tyne
Stephenson, Hugh..Throckley Ho., Newc.-on-Tyne
Stephenson, Marshall...Fourstones, Hexham
Stephenson, Wm...Throckley Ho., Newc.-on-Tyne
Sterriker, John...Driffield
†Stevens, John...Holywell Street, Oxford
Stevens, J. Curzon Moore...Winscott, Torrington
Stevens, Rev. T....Bradfield Rectory, Reading
Stevens, William Carr...33, Mark Lane, E.C.
Stevens, William...Gatehampton, Reading
†Stevenson, Capt. C. B....Hennor House, Leominster
Stevenson, T. T....Byker, Newcastle-on-Tyne
Steward, A. Benn...Chapel House, Whitehaven
Steward, Charles...Thurleston Lodge, Ipswich
†Steward, Chas....Blundeston, Lowestoft
Steward, Wm....Lambton, Fence Houses
†Stewart, Alexander J. R....Ard House, Donegal
Stewart, Andrew...Newcastle-on-Tyne
Stewart, Arthur...Barton House, Gloucester
Stickney, William...Ridgmont, Hull
Stiles, Stephen...Shirburn Farm, Tetsworth
Stilgoe, Henry...Chapel Ascot, Southam
Still, Henry Chelsham...Croydon, S.
Stilwell, J. J. R....Fairfield, Chiddingfold, Surrey
†Stirling, William, M.P....Keir House, Perthshire
Stirling, Sir W., Bt....Burrs Wood, Tunbridge Wells
Stock, S....Blackley Hurst, St. Helen's, Lancashire
Stocker, J. P....93, Oxford Terrace, W.
Stokes, Charles...Kingston, Kegworth, Derby
Stone, J. J...Ashton Vil., Upper Lewisham Rd., S.E.
Stone, John S....Newport, Monmouthshire
Stone, N. Chamberlain...Ayleston Hall, Leicester
†Stoneham, Frederick...Crayford
Stonehewer, W. S., jun....Brunswick Terr., Brighton
Stopford, W. Bruce...Drayton House, Thrapstone
Storer, C., M.D....Lowdham Grange, Nottingham
Storer, Rev. John...Hellidon, Daventry
†Storrar, Robert...Grittleton, Chippenham
Story, J. B....Lockington Hall, Derby
Stott, John...Bothal Barns, Morpeth
Stott, Mrs....Eccleshill Hall, Leeds
Stowell, William Stow, jun....Darlington
†Stowey, Augustus...Kenbury House, Exeter
†Stracey, Henry J....Rackheath Hall, Norwich
Strachan, J. M....Teddington Grove, S.W.
Strafford, Henry...13, Euston Square, N.W.
Strangway, Henry Bull...Shapwick, Bath
†Stratford, H.S...ThorpeLubenhamHl., MarketHarb.
Straw, Fred....Stones Place, Skellingthorpe, Linc.
†Strathallan, Visc...Strathallan Castle, Auchterarder
Stratton, George...Spinnymoor House, Durham
†Stratton, J. Locke...Turveston House, Brackley
Stratton, Richard...Stapleton, Bristol
Strelly, Richard Clayton...Buckland Hollow, Belper
Streeter, William...Sandersteed, Croydon, S.
Strickland, Walter...Cokethorpe Park, Witney
†Strickland, Chas. William...Boynton, Bridlington
Strode, Geo. S....Newnham Park, Plympton, Devon
Stronge, Thomas...Cirencester
†Stuart, Lt.-Col. Wm., M.P....Kempston, Bedford
Stubbs, Chas....Preston Hill, Penkridge
Stubbs, John...Weston Hall, Stafford
Stuckey, H....Cothelstone, Bp.'s Lydeard, Taunton
Stucley, Lt.-Col. Sir G.S., Bt..Hartland Abbey, Bidef.
Sturgeon, Chas...South Ockenden Hall, Romford, E.
Sturgess, Thomas...Penshurst, Tunbridge
†Sturt, Hen. Chas., M.P....14, Grosvenor Street, W.
Stutfield, W....Hildersham Rookery, Cambridgesh.
Suffolk, Earl of...Charlton, Malmesbury
Sumner, Rev. C. V. H....Ringwould Rectory, Dover
Surman, J. Surman...Swindon Hall, Cheltenham

†**Surtees**, Henry Edward...Dane End, Ware
Surtees, Robert L....Redworth House, Darlington
Surtees, Villiers C. V...Benbridge Ho., Newc.-on-T.
†**Surtees**, Wm. Edward...Tainfield Ho., Taunton
Sutcliffe, Rev. Thos....Royd Ho., Heptonstall, York
†**Sutherland**, Duke of, K.G...TrenthamPk.,Newc.-u-
Sutton, John...Moston Manor, Sandbach [Line
†**Sutton**, Martin Hope...Portland Place, Reading
Swaffield, Benj....Pilsbury, Ashborne, Derbyshire
Swaine, John C....3, Chester Terrace, Cirencester
Swaine, S. H....Bradford, Yorkshire
Swan, Joseph...Newcastle-on-Tyne
Swan, Joseph...High House, Morpeth
Swan, Mark...Lesbury, Alnwick
Swan, Richard...North Shields
Swan, Richard...Newcastle-on-Tyne
Swan, Wm....Walker, Newcastle-on-Tyne
Swan, W. R....Wall's End, Newcastle-upon-Tyne
Swann, John...Bedlington, Morpeth
Swann, William...Bedlington, Morpeth
Sweeten, Benjamin Thomas...Ash Grove, Penrith
†**Swete**, John B....
Swinburne, George...Red Hills, Penrith
Swinburne, T. W....Winchcomb, Gloucestershire
Swinford, John...Strode Place, Herne, Kent
Swinnerton, Robert...Weddington, Nuneaton
Sworder, H....Hallingbury Hall, Bishop Stortford
Sworder, J....West Mill, Bury, Buntingford, Herts
Sworder, William...Tawney Hall, Romford, E.
Sydney, Viscount...3, Cleveland Square, S.W.
Sykes, Edmund...Mansfield Woodhouse, Notts
Sykes, John...Croes Howell, Wrexham
†**Symonds**, Thomas Powell...Pengethley, Ross
Symondson, Geo..Upshire Ha., Waltham Abbey, N.
Symons, Thomas George...Mynde Park, Ross
†**Synge**, Francis Hutchinson...Dysart Lodge, Corofin

T.

Tabley, Lord de...Tabley House, Knutsford
Tait, Henry...Shaw Farm, Windsor
†**Talbot**, Henry...Cockfield Hall, Sudbury
Talbot, C. R. M., M.P....Margarn, Glamorganshire
Talbot, de Malahide, Lord...Malahide Cas., Dublin
Talbot, Hon. & Rev., G. G. C...Withington, Chelt.
Talbot, Hon. Col. W. P....Honeybourne, Gloucester
Talbot, Wm....Lane House, Burton, Westmoreland
Talbot, Wm., jun....Lane Ho., Burton, Westmoreld.
Talbot, Wm. H....Southport, Lancashire
Tallant, Francis...Elmsted, Ashford, Kent
Tamplin, R. G....Morrastone, Ross, Hereford
Tanner, Henry...Victoria Road, Cotham, Bristol
Tanner, Joseph...Mudeford House, Christchurch
†**Tanner**, William...Patcham, Brighton
Tanton, E....Hill Farm, Torrington, Devon
Tapply, E. S....Knowlton, Wingham
Tasker, William...Waterloo Iron Works, Andover
Tate, John...Bilton, Alnwick
Tattersall, E....1,Tattersall's Yd.,Grosvenor Pl.,S.W.
Tattersall, John...Great Ealing, W.
Tattersall, William...Kirkstall Bridge, Leeds
Tatton, T. W....Wythenshawe Hall, Manches
Taunton, William...Redlynch, Salisbury
Tavendale, Joseph...Pendley Farm, Tring
Tawney, A. R....Banbury
Tayler, Rowland...Colchester
Taylor, Charles...The Green, Bromyard
Taylor, Sir Charles, Bt....Forest Lodge, Liph
†**Taylor**, Chas. H....Bamburgh Friars, Belford
Taylor, Francis Howard..Burntwood Hall, Ba
Taylor, George...Dudley, Staffordshire
†**Taylor**, George Edward...Oatlands, Leeds
Taylor, Henry T....Holmer House, Hereford
Taylor, James...Stretford Court, Leominster
Taylor, James...Newcastle-on-Tyne
†**Taylor**, J....Burnfoot House, Wigton, Cumb
Taylor, John...Moreton Hall, Whalley, Black
Taylor, John...Aston Clinton, Tring
Taylor, John...Rajhmahal, Bengal
Taylor, J., jun..Sandycroft Farm, Hawarden, C
†**Taylor**, Joseph...Bishop's Stortford
Taylor, Mark...Aston Tirrell, Wallingford
†**Taylor**, R...6, Queen St. Pl., Up. Thames St.
Taylor, R. P....Adelaide Pl., London Bridge,
†**Taylor**, Sam....Eccleston Hall, Prescot, Lan
†**Taylor**, Simon W....Erchfort Manor Ho., De
Taylor, Thomas...Burleigh Villa, Wellington,
Taylor, Thomas...Ashton House, Tetsworth
Taylor, T. Loombe...Starston, Harleston, Norf
Taylor, William...Harptree Court, Bristol
Taylor, William...Addington Lodge, Croydon
Taylor, Wm....Showle Court, Stoke Edith, He
Taylor, William...Groby Cottage, Leicester
Taylor, William...Thingehill Court, Hereford
Taylor, Wm. Hy....High Hatton, Shawbury,
Tayton, William...Syderstone, Fakenham
Teasdale, Robert...71, Westgate St., Newc.-on
†**Teleki**, Countess Harley..Eywood, Kington,H
Temperley, J....Eland Hall, Ponteland, Nort
Temperley, W. Angus...Westfield House, He
†**Tempest**, C. Henry...Broomlands, Nantwic
Tempest, Colonel...Tong Hall, Leeds
Tempest, F. Roger...Ackworth Grange, Pont
Tempest, Sir C....Broughton Hall, Skipton, Yor
†**Templemore**, Lord..Dunnoby Pk., Wexford, I
Templeton, A....Glanhenwy, Glasbury, Heref
Templetown, Visct...27, George St., Hanover S
Tench, John...Ludlow
Tennant, Joseph Mason...Headingley, Leeds
Tennant, J. R....Kildwick Hall, Skipton, York
†**Tennant**, Robert...Scarcroft Lodge, Leeds
Tennant, Thomas...Blenheim Terrace, Leeds
Terry, Edward, jun....Walton, Aylesbury
Teverson, Henry...High Garrett, Braintree
Terry, Rev. Stephen...Dummer, Basingstoke
Thackeray, Capt....Junior United Serv. Club,
Thackwell, John Cam...Dymock, Gloucester
†**Thew**, Edward...Lesbury House, Alnwick
Thistlethwaite, Thomas...Southwick Pk., Far
Thomas, David...Brecon
Thomas, E. David...Welfield House, Builth, I
Thomas, F. H....Hereford

Thomas, George...18, Redcliff Street, Bristol
†Thomas, G. T....Ermatingen, Thurgovie, Switzerl.
Thomas, John...Bletsoe, Bedford
Thomas, L. H....Caerffynnon, Talsarna, Caernarvon
Thomas, R. Goring...Ferry Side, Carmarthen
Thomas, Rees...Dolellan, Llandysail, Carmarthen
Thomas, Thomas...St. Hilary, Cowbridge
†Thomas, Rev. W. J...Llan Thomas, Hay. Herefordsh.
Thomasson, William...Barnby Moor, East Retford
Thompson, Alexander...Kirknewton, Wooler
†Thompson, Andrew...Berwick-on-Tweed
Thompson, Andrew...Keele, Newcastle-under-Lyme
†Thompson, Anthony...Cross, Whitehaven
Thompson, Cuthbert...Winlaton, Blaydon-on-Tyne
Thompson, Francis...Burton-on-Trent
Thompson, Capt. F. W...Willow Lod., Finchley, N.
Thompson, George...Dudley, Worcestershire
Thompson, George...Havelock St., Newc.-on-Tyne
Thompson, G. A....Kirkhouse, Brampton, Cumberl.
Thompson, Henry A...Lewes
Thompson, James...Bishop Auckland Durham
Thompson, John...Paston, Coldstream
†Thompson, John...Badminton, Chippenham
†Thompson, John B....Anlaby, Hull
Thompson, Leonard...Sheriff Hutton Park, York
Thompson, Matt....Kirkby Stephen, Westmoreland
Thompson, Thos. H....Cavil Head, Acklington
Thompson, W....12, Dunsford Place, Bathwick, Bath
†Thompson, W., jun...Thorpe-le-Soken, Colchester
†Thompson, William...Weymouth
Thompson, William...Esh Lande, Esh, Durham
Thompson, William...Tregoyd Farm, Hay
Thomson, Guy...Old Bank, Oxford
Thomson, R. J....Grange, Kilmarnock
Thomson, Robert T....Broomford Manor, Exbourne
Thomson, Wm. C....Dilston Haugh, Corbridge
Thorn, James...Brackinburgh, Penrith
†Thornes, Joseph...Green House, Ossett, Wakefield
Thornhill, George...Diddington, Huntingdon
Thornhill, Obadiah...Barthomley, Crewe
†Thornhill, T....Riddlesworth Hall, Thetford
Thornhill, Wm. Capel Clarke...Rushton, Kettering
†Thornhill, W. P., M.P....Stanton Hall, Bakewell
Thornton, C. George...Marden Hill, Hertford
Thornton, Edward...Little Pitchford, Shrewsbury
Thornton, Harry...Turvey, Newport Pagnell
†Thorold, Richard...Weelsby Hall, Grimsby
Thorp, R. H....Temple, Selby
†Thorp, Thomas...Alnwick
†Thorp, Ven. Archd. T..Kemerton Rect., Tewkesbury
Thorp, T. H....Broyle Place Farm, Ringmer, Lewes
Thorpe, J. Cole...Otley Ho., Walesby, Market Rasen
Thoyts, Mortimer G....Sulhamstead House, Reading
Thresher, Fred. R....Marsh Ho., Bentley, Farnham
Thring, Robert...9, Whitehall Place, S.W.
†Throckmorton, Sir W., Bt....Buckland, Faringdon
†Thurlow, T. Lyon...Baynard Park, Guildford
†Thurnall, Henry...Royston, Herts
Thursby, Rev. F....Abington Rectory, Northampton
Thursby, Major John H...Snydale Hall, Pontefract
Thursfield, T. H....Barrow, Broseley
Thynne, F. George...Fleaford Lodge, Guildford

†Tibbits, Capt. J. Borlace..Barton Seagrave, Kettering
Tiersonnier, Alphonse...Colombier, Nevers, France
Tiffen, Joseph...North Skirlaugh, Hull
†Tighe, Rt. Hon. Wm. F....Inistioge, Ireland
Tilden, John...Ifield Court, Gravesend
†Tillard, Philip...Stukeley Hall, Huntingdon
†Timbrell, Robert...Beckford, Tewkesbury
Timm, Joseph...
Timmis, Richard...Darlington St., Wolverhampton
Timson, Rev. Edward...Tatchbury, Southampton
Tindal, C. G....Blackgang, Isle of Wight
Tinkler, Robert...Penrith
†Tinne, John A....Briarley, Aigburth, Liverpool
Tippler, Wm....Roxwell, Chelmsford
†Todd, John...Mireside, Wigton, Aspatria, Cumb.
Todd, John...Burdon Pl., Jesmond, Newc.-on-Tyne
Toder, John...South Muskham, Newark-on-Trent
†Tollemache, H. B....Jun. United Service Cl., S.W.
†Tollemache, J., M.P....Tilston Lodge, Tarporley
Tombs, John...Hatherop, Fairford
Tombs, J. King...Lanford, Lechlade
Tomes, Alfred...Rouse Lench, Evesham
Tomkinson, William...Newcastle, Staffs.
Tomlin, H. Currer...St. Margaret's, Ware
Tomline, Col. G., M.P....1, Carlton Ho. Ter., S.W.
Tomlinson, Capt. Frederick W....Leamington
Tomlinson, J. Edward...
Tomlinson, Wm...Biggins House, Kirkby Lonsdale
Tompson, Edw. C. S....Dromenagh, Iver, Uxbridge
Tompson, H. Kett...Witchingham Hall, Norwich
Tompson, R. James...Iver House, Uxbridge
Tomson, James...Barnt Green, Bromsgrove
Tonge, Charles...Ashfield House, Lincoln
Tonge, W., sen....Chevening, Sevenoaks
†Tooke, Rev. J. T. H....Scawby Vicarage, Brigg
Tooke, William...12, Russell Square, W.C.
Toomer, G. Edw....Hoaden House, Ash, Sandwich
†Torr, William...Aylesby Manor, Great Grimsby
Torrens, Robert, M.P....Ramslade, Bracknell
Toulson, John Parker...Skipwith Hall, Selby
Tovey, Robert...Fairford
Toward, Andrew...Osborne, Isle of Wight
Towell, Samuel...Rutland House, Newmarket
Tower, Christopher T....Weald Hall, Brentwood
Towgood, Edward...St. Neot's
Townend, Thomas...Knockholt, Kent
Townley, Rev. Gale...Beaupre Hall, Wisbeach
Townsend, G. Barnard...The Close, Salisbury
Townsend, Hen....Rydinghurst, Cranley, Guildford
†Townsend, Rev. C. G. G....Hatfield Peverel
Townsend, W. H...Shantian House, Cotham, Bristol
Townshend, Charles...Pulford, Chester
Traherne, G. M....St. Hilary, Glamorganshire
Travers, Peter F....Great Carlton, Louth
Treadwell, John...Waddesdon, Aylesbury
Trebeck, Thomas...Southwell
Treby, Henry Hele...Goodamoor, Plympton, Devon
Tredwell, John...Leigham Court, Streatham Hill, S.
†Tredegar, Lord...Tredegar Park, Newport
Tregelles, E. O....Derwent Hill, Shotley Bridge
†Treherne, Morgan...
Tréhonnais, R. F. de la..The Elms, Bickley Pk., S.E.

†Tremayne, John...Heligan, St. Austle
†Trench, Henry...Cangort Park, Roscrea, Ireland
Trench, W. S...Essex Castle, Carrickmacross, Ireland
Trethewy, Alfred H....Blickling, Aylsham, Norfolk
Trethewy, Henry...Grampound
Trethewy, Henry, jun....Silsoe, Beds
Trevelyan, Sir W. C., Bt....Wallington, Newc.-on-T.
Trimmer, Charles...Alton, Hants
Trinder, Edward...Cirencester
Trinder, Thomas...Sandlin, Leigh Sinton, Malvern
Trollope, Sir J., Bart., M.P....Caswick, Stamford
Trood, Edward...Matford House, Exminster
Trotter, Theodore...Greetwell House, Lincoln
Trotter, Thomas...Bywell, Stocksfield
Trotter, William...South Acomb, Stocksfield
Trouncer, J. H., M.D....6, Mount Street, W.
Trower, Capt. E. S....Stansteadbury, Ware
Trumper, Edward...Nuneham Park, Oxford
Trumper, Joseph...Lake End, Burnham, Bucks
†Tryon, T....Bulwick, Wansford, Northamptonshire
Tuck, Rev. G. R....Blofield, Norwich
Tuck, Henry...Shirley, Ringwood
Tuck, Henry...The Hall, Ingatestone
Tucker, Edwin...Frogmore Street, Abergavenny
†Tucker, Henry...Bourton Ho., Shrivenham, Berks
†Tuckett, P. D., jun....76, Old Broad Street, E.C.
†Tudor, Geo. S....Park House, Lapley, Penkridge
†Tull, Henry...Crookham, Newbury
†Tull, Richard...Crookham, Newbury
Turk, William...Charlton Kings, Cheltenham
Turnbull, Edward...West Hartlepool
Turnbull, George...Horton, Belford
†Turnbull, John George...Pinner, Watford
†Turnbull, Rev. T. S....Blofield, Norfolk
Turnbull, William...Horton, Belford
Turnbull, W....2, West George St., Newc.-on-Tyne
Turner, E. R. T....St. Peter's Iron Works, Ipswich
Turner, Frederic...Palmer's Green, Southgate, N.
Turner, Fred. John...The Dean, Kilmarnock, Ayr
Turner, Fred....St. Peter's Iron Works, Ipswich
Turner, George...Beacon Downes, Exeter
Turner, George, jun....Alexton Hall, Uppingham
†Turner, Lieut.-Col. F. Henry...Gouray, Jersey
Turner, J. Singer...Chyngton Farm, Seaford, Lewes
Turner, John...Stanwell, Staines
Turner, John...Englefield, Reading
Turner, J. H...Little Horringer Hall, Bury St. Edm.
Turner, John James...Newcastle-on-Tyne
Turner, J. W....Hopton, Mirfield, Normanton
Turner, Philip...The Leen, Pembridge, Herefordsh.
Turner, P. Henry...Whitlocksworthy, Kingsbridge
Turner, William...Newtown, Montgomery
Turner, William, jun....Stourton, Birkenhead
†Turner, W. Beckett...Penleigh House, Westbury
†Turnor, Christopher...Stoke, Grantham
Turnor, Michael...Brereton, Rugeley
Turvill, G....Manor Farm, East Shalford, Guildford
Tuson, Rich. V...R. V. College, Camden Town, N.W.
Tuxford, Jos. Shephard...Skirbeck, Boston
Tweddle, John...
Tuxford, Weston...Boston
Twitchell, Thomas...Willington, Bedford
Tylden, Lt.-Col. Sir J....Milsted, Sittingbourne
Tyler, John...Leyton, Essex, N.E.
Tyler, Rev. Roper T....Llantrithyd, Cowbridge
†Tyler, Sir Jas., Kt....Pine House, Holloway, N.
Tyrell, Sir J. T., Bart....Boreham Ho., Chelmsford
†Tyringham, Wm. B...Tyringham, Newport Pagnell
Tyrrell, John...St. Leonard's, Exeter

U.

Umbers, Abraham...Weston Hall, Leamington
†Umbers, Edward...Wappenbury, Leamington
Umbers, Samuel...Wappenbury, Leamington
†Umfreville, S. C....Ingress Abbey, Greenhithe
Underhill, W. S....Newport, Salop
†Underwood, Joseph...5, Hyde Park Gardens, W.
Unsworth, John...The Thorn, Penrith
Unthank, John...Netherseales, Penrith
Upfill, Thomas B....Sheepcote Street, Birmingham
†Upperton, Robert...35, Steyne, Brighton
Upton, H., jun....Aldwick, Bognor
Upward, A....
Urwick, Edward...Felton, Ludlow
†Usedom, Baron von...Berlin
Usher, George M....Railway Street, Beverley
Usher, John...Eldon Street, Newcastle-on-Tyne

V.

Vaizey, George De Horne...Halstead
†Vaizey, John Robert...Attwoods, Halstead
Vallance, James...Hurstpierpont
†Valle, Conde Del...Vergana Gurpoisea, Spain
Vallentine, R....Burcott Lo. Fm., Leighton Buzzard
Valpy, Robert Harris...Ilfracombe
Vanderstegen, W. H....Cane End House, Henley
†Vane, Rev. John...Burrington, Bristol
Varnell, G. W....R.V. College, Camden Town, N.W.
Vaughan, John W....Velinnewidd House, Brecon
†Vaughan, Nash V. E....Rhesta, Neath, Glamorg.
Vaughan, William Brettell...Ludlow
†Vaux, Lord, of Harrowden...Highams, Bagshot
†Vavasour, Sir H. M., Bt...8, Up. Grosvenor St., W.
Veitch, Harry Jas....Exotic Nurseries, Chelsea, S.W.
Veitch, Jas., jun....Exotic Nurseries, Chelsea, S.W.
†Vere, John...Carlton-upon-Trent, Newark, Notts
†Verner, Edw. Wingfield...86, Eaton Square, S.W.
†Verney, Sir H., Bt., M.P....Claydon House, Winslow
†Vernon, Hon. A. H....Sudbury, Derby
Vernon, Hon. F. H....Farming Woods, Thrapstone
†Vernon, Harry F., M.P...Hanbury Hall, Droitwich
Vernon, Granville H....East Retford, Notts
Vernon, Hon. G. R....Farming Woods, Thrapstone
Vernon, Hon. & Rev. J. V....Nuttall Rec., Nottingham
Vernon, Robert...Broad Chare, Newcastle-on-Tyne
Vernon, William...Shaw Farm, Tarporley
Verrall, Richard Relfe...Falmer, Lewes
Vesey, Charles C....Lucan House, Lucan, Dublin
†Vevers, Charles...Ivington Park, Leominster
Vevers, J. Brace...Yarkhill Court, Ledbury
Viall, King...Stoke, Clare, Suffolk
Vickerman, Charles R....Thoby Priory, Brentwood
Vickers, Thomas...Ardwick Green, Manchester
†Vickers, V....Ellerton Grange, Newport, Salop
Villar, James...Charlton Kings, Cheltenham
Villiers, Hon. F. W. C....Welford, Northamptonshire

Vincent, H. Wm...Thornwood Lodge, Kensington, W.
†Vincent, James...Clifton Maybank, Yeovil
Vivian, Lord...Glynn, Bodmin
Vivian, George...11, Upper Grosvenor Street, W.
Vivian, Maj.-Gen. Sir R. J. H., Bt., K.C.B..Caterham
Voile, John, jun....Churchover, Rugby
†Voile, Thomas...Frolesworth, Lutterworth
Voss, Wm....West Bucknowle, Corfe Castle, Dorset

W.

†Waddilove, G. M. D....Brunton House, Hexham
†Waddingham, J...Guiting Grange, Winchcomb
Waddington, Edward...Wakefield
Waddington, J....Langrish, Petersfield
†Wade, R...58, Upper Seymour St., Portman Sq., W.
Wade, R. Craven...Clonbranic, Crossakeile, Meath
Wagner, G.H. M....77, Marina, St. Leonard's-on-Sea
†Wagstaff, Thomas...Stifford, Romford, E.
†Wainman, W. Bradley...Carhead, Crosshills, Leeds
Wainwright, C. Rawlinson...Shepton Mallet
Waites, John Merrick...Gloucester
Wakefield, George...Minworth, Birmingham
Wakefield, John...Sedgwick, Milnthorpe
†Wakefield, W. H....Prizet, Kendal
Walbey, Samuel...Barley, Royston
Waldron, J. Lovegrove...Ramsbury, Hungerford
Waldy, Edward...Barmpton, Darlington
Waldy, William...Great Burdon, Darlington
Walker, Caleb...Chillesford Lodge, Wickham Mrkt.
Walker, D. M....Gloucester
Walker, Elisha...Brereton, Sandbach
Walker, Sir E. S., Knt....Berry Hill, Mansfield
†Walker, Frederick James...Claxton Grange, York
Walker, George Henry...Newbold Grange, Rugby
Walker, G. H....Oakleigh, East Grinstead
Walker, G. J. Alexander...Norton, Worcester
Walker, James...Northleach
Walker, John...Goldington, Bedford
Walker, John...Westfield House, Holmer, Hereford
Walker, John Deverell...Nottingham
†Walker, John...Mount St. John, Thirsk
Walker, John...Newton Bank, Chester
†Walker, John...Cooper's Row, Tower Hill, E.C.
†Walker, John L....71, Oxford Terrace, W.
Walker, Joseph Need...Calderstone, Liverpool
†Walker, Ormerod Oliver...Bury, Lancashire
Walker, Lawrence...12, Bryanston Square, W.
Walker, Marmaduke..Addington Lod., Croydon, S.
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